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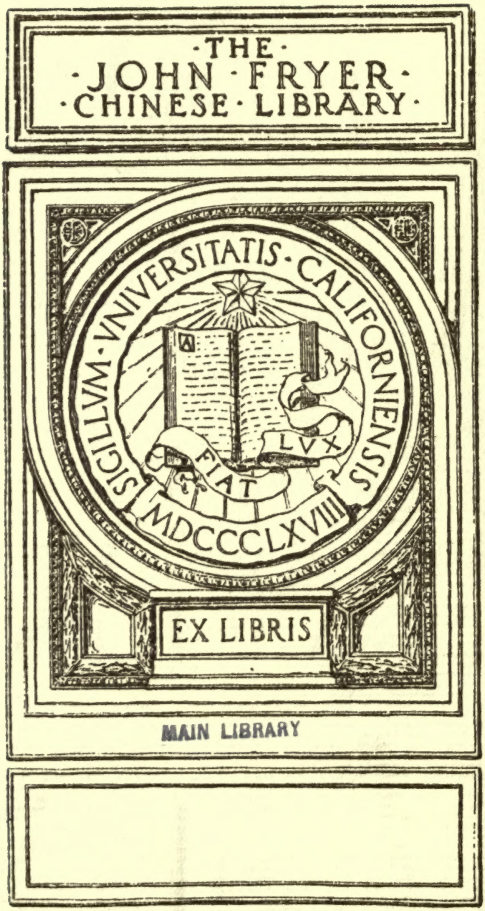

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PART I

MEDICINAL PLANTS

BEING

DESCRIPTIONS WITH ORIGINAL FIGURES

OF THE

PRINCIPAL PLANTS EMPLOYED IN MEDICINE

AND AN ACCOUNT OF THEIR

PROPERTIES AND USES

BY

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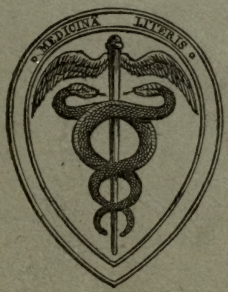

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CISSAMPELOS PAREIRA. *Linn.*

N. Ord. MENISPERMACEÆ.

Tribe *Leptogoneæ*.

Genus Cissampelos,* *Linn.* B. & H., Gen. i, p. 37; Baill., iii, p. 41; Miers, l. c., p. 127. Species variously estimated at 18 or 70, found in the tropics and warm regions of both hemispheres.

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15. Cissampelos Pareira,† *Linn., Sp. Pl., ed.* 1, *p.* 1031 (1753).

Velvet Leaf.

Syn.—C. microcarpa, *DC.* C. clematidea, *Presl.*

Figures.—Woodville, t. 65; Nees, t. 367; Baill., l. c., figs. 22–28; Descourtilz, Fl. Antilles, iii, t. 201.

Description.—A woody climber or twiner with slender terete stems of light open structure, and rarely reaching an inch in diameter, covered with a light brown wrinkled bark, and with thickened nodes at long intervals; the young green shoots elongated, slender, and whiplike, densely downy at the ends. Leaves alternate, on longish slender petioles inserted more or less within the margin of the blade, 1—2 inches long, nearly orbicular, with an acute apex and faintly cordate base, entire, palmately veined, smooth above, silky beneath or when young on both sides, bright full green. Flowers dicœcious, very small; the male in branched, solitary or fasciculate, rather dense panicles, with filiform divaricate dichotomous branches; the female stalked, in fascicles of 5 or 6 in the axils of roundish, leafy, readily deciduous bracts, laxly arranged on a slender axillary branch. Male flowers:—Sepals 4, spathulate-ovate, with long hairs outside, entire, spreading; petals combined into a cup-shaped 4-lobed corolla; stamen solitary (?), central, filament short, capitate at the summit, bearing 4 anther-cells on its margin. Female

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* Named from κισσός, ivy, and ἄμπελος, a vine; from the appearance. The κισσάμπελος of Dioscorides was, of course, not this plant.

† *Pareira*, so named by Linnæus under the idea that this yielded the *pareira brava* of commerce.

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flowers :—Sepal solitary, oval, hairy outside; petal solitary opposite the sepal and like it in form and size or smaller, greenish-white; pistil of one carpel, ovoid, gibbous on the side opposite the petal, densely silky, style short, stigmas 3, pointed, spreading, ovary one-celled, with a single suspended ovule. Fruit a single small, ovoid drupe, with the remains of the style near the base, epicarp slightly fleshy, thin, pilose, endocarp (putamen) compressed, transversely ridged and furrowed on the edge, hollowed on the sides, cavity horse-shoe-shaped from the doubling-in of a process of the endocarp. Seed strongly curved, filling the cavity; testa very thin, attached to the process; embryo slender, terete, much curved in the axis of the endosperm; cotyledons linear, incumbent.

Habitat.—If we restrict this species as does Mr. Miers it is found in the West Indian Islands and Central America only; if we follow the authors of the 'Genera Plantarum' it is very widely diffused over all the tropical regions of both hemispheres. There is no occasion here to go into questions of the definition of species, on different views of which this variance depends. The plant of the West Indies, which appears to be very common in most of the islands, and has been long familiar, is certainly the form upon which Linnæus founded the species. The plant was introduced about 1780, and at Kew flowers in July and August.

Lunan, Hort. Jamaic., ii, p. 254; Descourtilz, Fl. Ant., iii, p. 231; Grisebach, Fl. Brit. W. Indies, p. 10; Miers, l. c., p. 139; Fl. Brit. India, i, p. 104; Brandis, Forest Fl. India, p. 10; Flück. & Hanb., Pharmacogr., p. 28; Lindl., Fl. Med., p. 372.

Official Part and Name.—PAREIRÆ RADIX; the dried root of Cissampelos Pareira, *Linn.* (B. P.). The dried root (*Pareiræ Radix*) (I. P.). PAREIRA, *Pareira Brava;* the root of Cissampelos Pareira (U. S. P.).

Source of Pareira Brava.—We have already stated under the head of *Chondrodendron tomentosum* that this plant and not the official plant now under notice is the source of the true Pareira Brava, that is, of the root which was originally used under that name, and

upon which its reputation as a medicine was founded. We also stated in the same place that the official *Cissampelos Pareira* was not even the source of the spurious root which had been the ordinary Pareira Brava of commerce for many years past, as the characters of its root were very different, as proved by Hanbury, both from it and from the true Pareira Brava. The characters of the drug derived from the official plant are now given.

General Characters and Composition.—A sample of this spurious Pareira Brava, as obtained from Jamaica by Hanbury, is in the form of long cylindrical stems, some of them terminating in roots, and others emitting roots here and there. These stems closely resemble the climbing stems of the common *Clematis Vitalba* of this country. They vary in diameter from about a quarter of an inch to an inch, averaging about half an inch. Externally they are covered by a light brown bark, which presents shallow longitudinal furrows more or less spirally arranged, and transverse knots placed at intervals of from one to three feet. The roots are somewhat darker in colour. A transverse section of the stem or root exhibits a pale greyish-brown wood, which is traversed by narrow medullary rays, which separate it into from 10 to 20 very porous converging wedges; but the large concentric zones as seen in the true pareira brava and the ordinary spurious drug are here absent. The wood is surrounded by a dark greyish-brown corky bark. Both root and stem are without odour; but they have a pure bitter taste, without any aromatic, sweetish, or astringent character.

We have already noticed under *Chondrodendron tomentosum* that the drug now under consideration contains the same bitter principle as that of the true Pareira Brava and of the common False Pareira Brava, namely, *Cissampeline* or *Pelosine*, and which Dr. Flückiger believes to be identical with *Beberia* or *Bebeerine* and also with *Buxine*.

Medical Properties and Uses.—The medical properties and uses of Pareira Brava are given under *Chondrodendron tomentosum*; but the drug now under notice, although used as a medicine in

the West Indies, does not appear to have ever been exported to Europe.

Pharmacographia, p. 26; Per. Mat. Med., by B. and R., p. 990; Flückiger in Pharm. Journ., vol. xi, 2nd ser., p. 192; Wiggers, Ann. Ch. Pharm., vol. xxviii, p. 29; Hanbury, in Pharm. Journ., vol. iv, 3rd ser., pp. 81 and 102; Amer. Journ. Pharm., Oct. 1, 1873.

DESCRIPTION OF PLATE.

The flowering plant drawn from a specimen in the Royal Gardens, Kew; the fruit and stem from specimens from Jamaica in the British Museum; the male flowers added from Baillon.

1. Young branch of a female plant with flowers.
2. A fascicle of female flowers.
3. A flower.
4. A sepal.
5. A petal.
6. A fruit.
7. The endocarp.
8. Section of fruit.
9. A male flower.
10. Section of same.
11. Portion of full-grown stem.
12. Transverse section of same.

(2, 7, 8 enlarged; 3, 4, 5, 9, 10 much magnified.)

D Blair ad nat. del et lith.

M & N. Hanhart imp

PODOPHYLLUM PELTATUM. *Linn*

N. Ord. BERBERIDEÆ.

Tribe *Berbereæ*.

Genus Podophyllum,* *Linn.* B. & H., Gen., i, p. 45; Baill., iii, p. 74. Species 2, one North American, the other from the Himalaya.

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17. Podophyllum peltatum, *Linn., Sp. Plant., ed.* 1, *p.* 505 (1753).

May-apple. Mandrake. Wild Lemon. (N. America.)

Figures.—Barton, ii, t. 25; Bigelow, ii, t. 23; Ehret, Plant. Select. (1750), t. 29; A. Gray, Ill. Genera, tt. 35, 36.

Description.—A perennial herb with a much elongated creeping rhizome, reaching 6 feet in length, which is cylindrical, rarely branched, dark brown, marked with the scars of the scales which clothe it when young, and at intervals of 2 or 3 inches with the bases of the flowering stems of previous years, terminating in an erect flowering stem, its growth in the horizontal direction being continued by a bud at the base of the flowering stem. Roots given off at each joint of the rhizome, fibrous, rather thick, simple. Stems either flowerless or flowering, erect, about a foot high, cylindrical, smooth, pale green or pinkish. Leaves on the flowerless stems solitary, peltate; on the flowering stems two, opposite, terminating the stem, petioles about 3 inches long, erect, curved, cylindrical, blade horizontal or somewhat inclined, about 5 inches wide, very deeply palmately cut into 5—7 oblong or inversely wedge-shaped segments coarsely toothed or cut at their ends, perfectly glabrous and shining, wavy, rather glaucous green. Flower solitary, about 2 inches across, on a short, strongly curved peduncle, coming off from the fork between the two leaves, with three small fugacious bracts beneath the flower. Sepals 6, unequal, quickly caducous, blunt, pale green, imbricate. Petals 6—9,

* Name from πούς, a foot, and φύλλον, a leaf, from the resemblance of that organ to the foot of some aquatic birds.

hypogynous, twice as long as the sepals, obovate-oval, nearly equal, delicate, finely veined, white, soon falling. Stamens 12—18, hypogynous, filaments slender, short, anthers linear, about as long as the filaments, 2-celled, bursting longitudinally. Pistil superior, composed of one carpel; ovary ovoid, smooth, one-celled, longer than the stamens, with numerous ovules arranged in many rows on the parietal (ventral) placenta; stigma almost sessile, large, thick, peltate, lobed and undulated. Fruit a yellowish berry, usually $1\frac{1}{2}$ to 2 inches long, ovoid, soft, and fleshy, indehiscent. Seeds about 12 or more, attached to the greatly enlarged placenta, yellow, each surrounded by a pulpy aril, which nearly encloses it, the whole forming a soft mass which completely fills the cavity of the fruit; embryo small, at the base of the abundant endosperm.

Habitat.—This pretty plant is very common in rich moist woods throughout the United States and Canada, and is in flower in May. The fruit is not ripe till the autumn, and is somewhat sparingly produced; it has a very pleasant subacid flavour, and varies much in size, but is usually about as large as a plum. The May-apple will grow in England, where it was first cultivated in 1664, and is to be seen in most botanic gardens.

Hook, Fl. Bot. Am., i, p. 31; A. Gray, Man. Bot. U. S., p. 54; Chapman, Fl. South. States, p. 18; DC. Prod., i, p. 111; Lindl., Fl. Med., p. 13.

Official Parts and Names.—1. Podophylli Radix; the dried rhizome: 2. Podophylli Resina; the resin (B. P.). The dried rhizome (I. P.). Podophyllum, *May-apple;* the rhizome (U. S. P.).

1. Podophylli Radix. *Podophyllum Root. May-apple Root.*—*Collection and Commerce.* The root, or as it is more correctly termed the rhizome, is most active when obtained after the leaves have fallen; this is commonly the case about August, at which period it is therefore generally collected, and then dried for use. The dried rhizome is but rarely used in itself as a medicinal agent, but almost entirely for the preparation of the resin, the

Resina Podophylli of the Pharmacopœias, which is described below. This rhizome is imported from North America.

General Characters and Composition.—Podophyllum root, as it is commonly termed, consists of the rhizome and rootlets. In commercial specimens the rootlets are frequently altogether absent, but when present they are either attached to the lower surface of the rhizomes, or are mixed in a loose state with them. The rhizome is either simple or branched. In length it varies from about an inch to eight or more inches; and in thickness from two to four lines. The rhizome has commonly a somewhat flattened appearance, and if not much broken up it presents, at more or less distant intervals, large irregular tuberosities, which are marked above by a depressed scar indicating the point where the aerial stem was attached, and giving off below a variable number of rootlets, or when these are broken off their position is marked by whitish scars. The rhizome has a reddish- or blackish-brown, or reddish-yellow colour, and its surface is smooth or furrowed longitudinally. The rootlets vary in length, and in size they average about that of a common knitting-needle; they are smooth and somewhat lighter coloured than the rhizomes. Both the rhizome and rootlets are brittle, and their fracture is short, smooth, whitish, and mealy; their powder is of a yellowish-grey colour. The taste of both rhizome and rootlets is bitterish, acrid, and nauseous; and their odour disagreeable and narcotic, more especially when moistened with warm water.

The active purgative properties of podophyllum rhizome are due entirely to the resin, which is described below under its official name of Podophylli Resina. In addition to the resin, podophyllum rhizome also contains, as discovered by F. F. Mayer, of New York, a large proportion of the alkaloid *Berberine* or *Berberia;* and also *Saponine,* and another *colourless alkaloid,* which has not been yet further described; as well as an *odoriferous principle,* and some other unimportant substances.

2. Podophylli Resina. *Resin of Podophyllum. Resin of May-apple.*—This resin is largely manufactured in Cincinnati and in other places in the United States of America and elsewhere,

hypogynous, twice as long as the sepals, obovate-oval, nearly equal, delicate, finely veined, white, soon falling. Stamens 12—18, hypogynous, filaments slender, short, anthers linear, about as long as the filaments, 2-celled, bursting longitudinally. Pistil superior, composed of one carpel; ovary ovoid, smooth, one-celled, longer than the stamens, with numerous ovules arranged in many rows on the parietal (ventral) placenta; stigma almost sessile, large, thick, peltate, lobed and undulated. Fruit a yellowish berry, usually $1\frac{1}{2}$ to 2 inches long, ovoid, soft, and fleshy, indehiscent. Seeds about 12 or more, attached to the greatly enlarged placenta, yellow, each surrounded by a pulpy aril, which nearly encloses it, the whole forming a soft mass which completely fills the cavity of the fruit; embryo small, at the base of the abundant endosperm.

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2. Podophylli Resina. *Resin of Podophyllum. Resin of May-apple.*—This resin is largely manufactured in Cincinnati and in other places in the United States of America and elsewhere,

under the incorrect name of *Podophyllin.* It is contained in the proportion of 3½ to 5 per cent. in both the rhizome and rootlets. The best solvent of the resin is alcohol, and hence rectified spirit or alcohol is directed to be used in its preparation in the British Pharmacopœia, in the Pharmacopœia of India, and in the Pharmacopœia of the United States. As prepared, according to the directions of the British Pharmacopœia, it is a pale brownish-green amorphous powder, with an acrid bitter taste. It is entirely soluble in rectified spirit and in ammonia. It is precipitated from the former solution by water, and from the latter by acids. It is only partially soluble in ether.

Medical Properties and Uses.—Both the rhizome and the resin have been long held in high esteem in the United States as efficient hydragogue cathartics; and in small doses frequently repeated, as alteratives. The rhizome is, however, but now little employed, all its essential properties being concentrated in the official resin, which is by far the best form of administering this drug, and the one now generally in use. Many American physicians consider that they can use the resin in all cases with perfect safety and confidence where mercury is indicated, as they say it produces all the good, and none of the evil effects of mercurial preparations; hence, it has received the name of "Vegetable Calomel." The griping effects which are often produced by its use may be prevented by combining with it small doses of extract of henbane. As it is sometimes very uncertain in its action, it is better to prescribe it in combination with other purgatives, more especially aloes or colocynth. It has been largely used in constipation, and in affections of the liver generally, but more especially in congestion of that organ. It is also frequently employed in combination with acid tartrate of potash in dropsies; and in various rheumatic, scrofulous, and syphilitic affections it has been used with advantage. In small frequently repeated doses the resin has also been recommended as an alterative in bronchitic and pulmonary affections. Externally applied the resin of podophyllum acts as a powerful irritant, and in America it has on this account been used, when dissolved in alcohol, as a counter irritant.

Per. Mat. Med., by B. and R., p. 1007; Pharmacographia, p. 35; U. S. Disp., by W. and B., p. 692; Garr., Mat. Med., p. 184; Bentley, in Pharm. Journ., vol. iii, 2nd ser., p. 457; Journ. of the Philadelphia Coll. of Pharm., vol. iii, p. 273; Maisch., in Amer. Jl. Pharm., July, 1863, p. 383; Mayer, in Amer. Journ. of Pharm., March, 1863, p. 98; Amer. Journ. Pharm., vol. xix, p. 165, and vol. xxiv, p. 306; Ueber Podophyllin (Dissertation). Giessen, 1869.

DESCRIPTION OF PLATE.

Drawn from a specimen cultivated in Kew Gardens; the fruit added from A. Gray.

1. A bud.
2. Vertical section of flower.
3. Transverse section of ovary.
4. Vertical section of fruit.
5. A seed showing the fleshy arillus.
6. Section of seed.

(5, 6 enlarged.)

D.Blair ad nat del et lith.

M & N. Hanhart imp.

CISTUS CRETICUS, *Linn.*

N. Ord. CISTACEÆ. Lindl., Veg. K., p. 349; Le Maout & Dec., p. 238; Baill., Hist. Pl., iv.

Genus Cistus,* *Linn.* B. & H., Gen., i, p. 112; Baill., iv, p. 323. Species 20 or more, natives of S. Europe and the countries round the Mediterranean.

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24. Cistus creticus, *Linn., Syst. Nat., ed.* 10, *p.* 1077 (1759).

Ladano (Crete).

Syn.—C. vulgaris, var., *Spach.* C. villosus, var., *Boiss.*

Figures.—Woodville, t. 207?; Nees, t. 432; Fl. Græca, t. 495, cop. in Hayne, xiii, t. 33; Jacquin, Ic. Rar., i, t. 95; Reichenb., Ic. Fl. Germ., iii, t. 40; Willkomm, Mon. Cistin., t. 83.

Description.—A small bush with numerous spreading opposite terete branches, with a rough grey bark, the younger twigs densely covered with tufts of shortish white hairs. Leaves ½—1½ ins. long, opposite, readily falling, sessile, obovate-spathulate, acute or obtuse, tapering into the broad attenuated almost sheathing base, entire, bright green, shortly glandular and hairy in tufts on both sides, with prominent reticulate veins beneath, thick, wavy and crisped, the upper ones narrower. Flowers abundantly produced in small cymes at the extremities of the branches, 1½ inches wide, stalked. Sepals 5, leafy, very broadly ovate, suddenly narrowed to an acute apex, strongly veined, hairy like the leaves, and also with long hairs on the back, margins membranous, imbricate in the bud. Petals 5, roundish, imbricate, much crumpled in the bud, delicate, of a deep clear bluish-pink with a yellow base, soon falling. Stamens indefinite, hypogynous, inserted in several rows on the receptacle, with which they are articulated leaving circular scars after their fall, filaments orange coloured; anthers small, darker. Ovary shorter than the stamens, ovoid, densely covered with long white silky hairs, 1-celled (partially 5-celled), with 5 parietal placentas extending nearly or quite to the centre (where they are actually combined

* *Cistus*, in Greek κίστος or κίσθος, the classical name.

below), and then revolute on both sides towards the wall; ovules numerous, attached in two rows by long funicles to the revolute margins of the dissepiments; style simple, as long as the ovary; stigma capitate. Fruit a small capsule, $\frac{3}{8}$ inch long, ovate, acute, brown, hairy, furrowed, splitting loculicidally into 5 valves. Seeds numerous, with long funicles, orange-yellow, smooth or reticulate, roundish, flattened; embryo long, slender, curled up in the centre of the endosperm.

Habitat.—The Ladanum or Labdanum bush is a native of rocky ground in Macedonia, Thrace, Greece, and the islands of Crete, Rhodes, Sicily and Cyprus, in some of which it is very abundant. Boissier considers it a variety of the variable *C. villosus*, L., which is spread over the Mediterranean district from Italy to Palestine, and occurs also in Corsica and N. Africa. The leaves of the plant are exceedingly viscid; the glandular structure of the short hairs is figured in Unger and Kotschy's work on Cyprus quoted below (p. 403). It was in cultivation in England in 1731, and its delicate flowers may now be seen in most of our botanic gardens in June and July.

DC. Prod., i, p. 264; Boiss., Fl. Orient., i, p. 437; Unger and Kotschy, Die Insel Cypern (1865), pp. 336 & 393–410; Lindl., Fl. Med., p. 131.

Part Used and Name.—Labdanum, *Ladanum;* a viscid resinous exudation from the leaves and branches of various species of Cistus, more especially of C. creticus, *L.*, but also of C. ladaniferus, *L.*, C. laurifolius, *L.*, and C. salvifolius, *L.* It is not now official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United States. But it was formerly official in the London and other British Pharmacopœias, and in the United States Pharmacopœia.

Collection and Commerce.—Labdanum is collected in both Crete and Cyprus; that of the former island being known as Candian Labdanum, and that of the latter as Cyprian Labdanum. In Crete it is collected from about the middle of May to the middle of July, or during the hottest season, when the plants are very

glutinous from being covered with this resinous exudation. The collectors are called *Labdanists;* and for its collection they use a peculiar wooden instrument, which is termed an *ergastiri* or *lambadistrion;* this is a kind of rake, to which a double row of leathern thongs are fixed instead of teeth, and with which the leaves of the shrubs are lightly brushed backwards and forwards, so that the viscid resinous exudation may adhere to the pieces of leather, from which it is afterwards scraped off with knives, and subsequently kneaded and moulded into different forms. In Cyprus labdanum is collected by the shepherds by combing the resin from the fleeces of the sheep, which become loaded with it while they are pasturing. This is then purified by fusion in pots of wood or clay, and afterwards moulded into its various forms. It is stated that about 6000 lbs. are annually sent from Crete to Turkey, and that the yearly produce of Cyprus varies from about 2500 to 2800 lbs. Some Labdanum is also said to be collected in Spain and Portugal, but it is not an article of commerce.

General Characters, Varieties, and Composition. — There are two forms of Cyprian labdanum, namely, in sticks (*Labdanum in bacculis*), and in irregular masses (*Labdanum in massis*). In Crete the best labdanum is considered to be that which is moulded into contorted or spiral pieces (*Labdanum in tortis*), but Cyprian labdanum is preferred at Constantinople to the best from Crete. The purest labdanum has a dark reddish or almost black colour externally, and internally it is greyish. It readily softens by the heat of the hand, and is easily fused into a transparent liquid. Its odour is agreeable and balsamic, and its taste balsamic, bitterish, and slightly acrid. It is very inflammable, and burns with a clear flame. Labdanum is commonly very largely contaminated with sand and other earthy matters, sometimes to the extent of above 70 per cent. Guibourt found in pure labdanum 86 per cent. of *resin*, a little *volatile oil*, 7 per cent. of *wax*, and other unimportant constituents.

Medical Properties and Uses.—Labdanum possesses stimulant and expectorant properties, and was formerly much employed in catarrhal affections, dysentery, and several other diseases; but its

use in such cases is now obsolete. It was formerly official in our pharmacopœias, and entered as a constituent into some plasters, but it is rarely or ever used, even as an external application, at the present day, either in this country or the United States of America. Frictions with an oily solution of labdanum are still, however, highly esteemed in Cyprus as a remedy against catarrhal and rheumatic affections. The same solution was formerly regarded by the Turks as a most efficacious preventive against the plague, and for the same purpose it was the common practice to have pieces of labdanum affixed to their walking sticks, or to wear them as amulets.

At the present time labdanum is chiefly used by the Turks for fumigation, and to some extent also as a perfume.

Dioscorides, Mat. Med., lib. i, p. 128; Pliny, Hist. Nat., lib. xii, cap. 17; Belon, Observations de Plusieurs Singularités en Gréce, Asie, &c., lib. i, cap. 7; Tournefort, Voyage du Levant, t. i, p. 29; Lewis, Mat. Med., p. 368; U. S. Disp., by W. and B., p. 1627; Landerer, in Pharm. Journ., vol. x, 1st ser., p. 349, and vol. xi, p. 6.

DESCRIPTION OF PLATE.

Drawn from a plant in the garden of the Apothecaries' Company at Chelsea, flowering in June; the fruit added from Hayne.

1. Branch with flowers and foliage.
2. Pistil and insertion of petal and stamens.
3. Transverse section of ovary.
4. Fruit.
5. The same dehiscing.
6. Section of seed.

(2, 3, 5 enlarged; 6 much magnified.)

D'Blair ad nat. del et lith.

M& N.Hanhart imp.

GERANIUM MACULATUM, *Linn.*

N. Ord. GERANIACEÆ. Lindl., Veg. K., p. 493; Le Maout & Dec., p. 306; Baill., Hist. Pl., v.

Tribe *Geranieæ*.

Genus Geranium,* *Linn.* B. & H., Gen. i, p. 272; Baill., v, p. 35. Species over 100, distributed through all the temperate parts of the world.

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42. Geranium maculatum, *Linn., Sp. Plant.*, 1, *p.* 681 (1753).

Alum-root. Wild Cranesbill. (United States.)

Figures.—Barton, i, t. 13; Bigelow, i, t. 8; A. Gray, Ill. Genera, t. 150.

Description.—A perennial herb, with a rather thick, cylindrical, branched, pale brown rhizome, giving off filiform rootlets. Stem erect, about 1—1½ feet high, cylindrical, green, covered with spreading or deflexed hairs, once or twice branched dichotomously. Root-leaves large, on very long hairy petioles, palmately veined, 5 or 6 inches wide, deeply cut into 5 (or 7) digitate, spreading, narrowly obovate lobes, irregularly and bluntly cut at the end; stem-leaves opposite, shortly stalked, with narrowly lanceolate, acuminate stipules at the base; all bright green, slightly hairy or smooth above, paler and covered with erect hairs below. Flowers in small terminal umbellate cymes, slightly nodding when in flower, an inch or more across, regular, peduncles usually 2-flowered. Sepals 5, lanceolate, with a long filiform point, green, hairy, persistent, 3-veined, imbricate. Petals 5, convolute in the bud, broadly obovate or rounded, entire, delicately veined, clear light purple, fugacious, claw very short, bearded; 5 small "glands" alternate with the petals on the receptacle. Stamens 10, hypogynous, free; filaments dilated at the base, those opposite to the petals rather shorter; anthers oblong, versatile, 2-celled, purple. Pistil of 5 carpels, placed round and united to a long, beak-like prolongation of the receptacle; ovary deeply 5-lobed, 5-celled, with two ovules in each cell; styles long, thickened and hairy in their lower part,

* *Geranium*, in Greek γεράνιον, the classical name; from γέρανος, a crane.

united to the central beak, but separate at the end to form 5 recurved branches, with the stigmatic surface internal. Fruit dry, the 5 small, hairy, 1-seeded carpels (cocci) separating septicidally and being carried away from the axis by the styles, which become detached from below and curve upwards elastically, so as to turn the cocci outwards and allow the seed to fall out. Seeds oblong, faintly reticulate under a lens; embryo with an incumbent radicle and large plicate cotyledons, no endosperm.

Habitat.—Very common in fields and bushy places in North America, extending from Canada throughout the United States, but only in the hilly districts in the south; a beautiful plant, flowering in the early summer. The name *maculatum* refers to the blotched appearance which the leaves assume as they become old. Frequently cultivated in this country. It is closely allied to the British Cranesbills *G. pratense*, L., and *G. sylvaticum*, L.

DC. Prod. i, p. 642; Hook, Fl. Bor.-Am., i, p. 115; A. Gray, Man. Bot. U. States, p. 107; Chapman, Fl. South. States, p. 65; Lindl., Fl. Med., p. 221.

Official Part and Name.—GERANIUM; the rhizome (U. S. P.). Not official in the British Pharmacopœia, or the Pharmacopœia of India.

Collection.—The rhizome is collected in the autumn months, or early in the spring before active vegetation has commenced; and then dried for use.

General Characters and Composition.—Geranium, as seen in commerce, either consists of the rhizomes alone, as is more generally the case, or of the rhizomes with small rootlets attached below; or rarely, the rootlets are seen in a loose state mixed with the rhizomes. It is commonly termed *alum-root*. The rhizome is usually simple, or rarely branched; it varies in length from one to about three inches, and in thickness from a quarter to half an inch or more. It is commonly much twisted, somewhat flattened, and marked externally with numerous wrinkles and thick hard projections of varying lengths, so that it presents an irregular, somewhat coralline appearance. It has a dark reddish or umber-brown colour externally; and a reddish-grey or pale flesh colour internally. It

has a compact texture, and a short close fracture. A transverse section shows a large central mass of a reddish-flesh colour, surrounded by a thin dark brown cortical portion. It has no odour, but a very astringent taste without any bitterness.

Geranium or alum-root appears to owe its activity solely to the presence of *tannic* and *gallic acids*, which according to the analysis of the Messrs. Tilden, of New York, are contained to the amount of about 4 per cent. The so-called active principle termed *Geranin* by the Eclectic practitioners in the United States, is a kind of *resinoid extract*.

Medical Properties and Uses.—Geranium is rarely used beyond the United States, but in that country it is extensively employed, and is regarded as applicable in all cases where astringent medicines are required. The absence of any disagreeable taste or other quality is also considered to render it peculiarly serviceable for infants, and persons of very delicate stomach. It has been employed internally in diarrhœa, chronic dysentery, cholera infantum in the latter stages, and in various hæmorrhages, with the greatest advantage. As a local application in chronic inflammation, ulceration, &c., benefit may be equally expected from it, as, for instance, in the form of a gargle where the throat is involved, and in that of injection in gonorrhœa and leucorrhœa.

U. S. Disp., by W. and B., p. 426; Per. Mat. Med., vol. ii, pt. 2, p. 705; Staples, in Journ. Phil. Coll. Pharm., Oct., 1829, p. 171; Amer. Journ. Pharm., vol. i, p. 171; Lee, in American Journ. Mat. Med., July, 1859, p. 199; Bentley, in Pharm. Journ., vol. v, 2nd ser., p. 21.

DESCRIPTION OF PLATE.

Drawn from a specimen in the garden of the Apothecaries' Company, Chelsea. 1. Upper part of flowering stem. 2. Root-stock and root-leaf. 3. Section of flower. 4. Ripe fruit after dehiscence. 5. Seed. 6. Transverse section of the same. (3, 5, 6 enlarged.)

D Blair ad nat. del. et lith.

M&N Hanhart imp.

POLYGONUM BISTORTA, *Linn.*

N. Ord. Polygonaceæ. Lindl., Veg. K., p. 642; Le Maout & Dec., p. 631.

Tribe *Polygoneæ*.

Genus Polygonum,* *Linn.* Meisner, in DC. Prod., xiv, pp. 83–143. Species 215, natives of all parts of the globe.

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212. Polygonum Bistorta,† *Linn., Sp. Pl., ed.* 1, *p.* 360 (1753).

Bistort. Snake-weed.

Figures.—Woodville, t. 232; Hayne, v, t. 19; Steph. & Ch., t. 48; Nees, t. 105; Curt., Fl. Londin., fasc. i; Syme, E. Bot., viii, t. 1243.

Description.—An herbaceous perennial. Root-stock cylindrical, woody, about as thick as a finger, widely creeping, much branched, ridged with leaf-scars on the outside, brownish, pale red within, giving off numerous fibrous roots, usually twisted into an S-shape, branches ending in tubers. Stems erect, quite simple, 1½—2 ft. high, cylindrical, smooth, striate, slightly thickened at the nodes. Radical leaves large, on long stalks, ovate, acute, abruptly constricted at the base and then attenuated into the petiole, margin entire, somewhat undulated; stem-leaves few, alternate, rapidly decreasing in size upwards, blade narrowly ovate, acute, sessile or nearly so, the petiole forming a long tubular sheath round the stem, continued above (for an inch above the blade in the lower leaf) into a scarious entire stipular appendage (ocrea); all dark green above, glaucous and pubescent on the prominent veins beneath. Flowers arranged in pairs, each couple surrounded at the base by two scarious cuspidate bracts, stalked, articulated to the summit of the smooth slender pedicels, and readily separating from them, one of the two expanding much before the other; clusters very densely crowded on the upper part of the stem, where they form a solid, cylindrical, oblong, blunt, erect in-

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* Name from πολύς, many, and γόνυ, a knee or knot, from the numerous nodes in some species.

† *Bistorta*, the mediæval name, from the twice-twisted root-stock.

florescence, 1—2 inches long. Perianth about $\frac{1}{6}$ inch long, tubular, compressed antero-posteriorly, of 5 oval, obtuse, pale pink, smooth leaves, slightly connected at the base, imbricate, two exterior. Stamens 8, hypogynous, but attached to the base of the perianth, placed 3 opposite two of the inner perianth leaves, 2 opposite the other, those opposite the centre of each of the 3 inner perianth leaves inserted by a broad, flattened, red base adherent for some distance up, much exserted; filaments slender, white; anthers small, versatile, purple. Ovary very small, trigonous; styles 3, distinct, filiform, shorter that the stamens. Fruit a small, indehiscent, triquetrous, dark-brown, shining, pointed nut, a little exceeding the withered perianth, and containing a single erect seed. Seed completely filling the fruit; embryo lateral, curved; radicle superior; endosperm mealy.

Habitat.—This is a well-known plant, though scarcely common, in moist or swampy meadows and on the borders of damp woods, throughout Great Britain, but is thought to be introduced in many localities. When once established it is with great difficulty eradicated, the leaves frequently forming large patches year after year without any flowering-stems being sent up. The Bistort has a wide range throughout the Northern Hemisphere, reaching from the arctic regions of Europe, Asia, and America to South Europe, the Himalayas and Canada. Arctic specimens only 4 or 5 inches high.

Meisner, l. c., p. 125; Hook. f., Stud. Fl., p. 307; Syme, E. Bot., viii, p. 78; Wats., Comp. Cyb. Br., p. 298; Ledebour, Fl. Ross., iii, p. 518; Hook., Fl. Bor.-Amer., ii, p. 130; Lindl., Fl. Med., p. 361.

Part Used and Name.—Bistortæ Radix; the dried rhizome or root. It is not official in the British Pharmacopœia, or the Pharmacopœia of India, or the Pharmacopœia of the United States. But it was formerly official in the Dublin Pharmacopœia.

General Characters and Composition.—Bistort root, or more properly Bistort rhizome, derives its name from being commonly twice folded or twisted on itself, and hence this character is one of its most marked peculiarities. It is cylindrical, somewhat flat-

tened, usually about the thickness of the little finger, and marked externally with transverse or annular wrinkles, which give it a roughish appearance. It has a hard firm texture, a deep reddish-brown colour externally, and a reddish or flesh-colour internally; it is without odour, but with a strong, pure, astringent taste.

Bistort root has never been carefully analysed, but its principal constituents are *tannic acid*, of which it contains a large quantity, some *gallic acid*, and much *starch*. Its virtues are extracted by water, and its decoction becomes inky-black on the addition of a persalt of iron, and with gelatine it forms a precipitate.

Medical Properties and Uses.—It is one of the most powerful of our indigenous astringents, although now but very rarely employed, its use having been superseded by catechu, kino, and other astringents of foreign origin. A decoction is, however, sometimes used as an astringent injection in leucorrhœa and gleet; as a gargle in spongy gums and relaxed sore throat; and as a lotion to ulcers attended with a profuse discharge. It has been highly recommended by Cullen for internal use in combination with gentian in intermittents, and it has also been employed in passive hæmorrhages and chronic alvine fluxes. Formerly it was much esteemed, as is shown by the following extract from Gerarde's Herbal:—"The juice of Bistort, put into the nose, prevaileth much against the disease called Polypus. . . The root boyled in wine, and drunke, stoppeth the bloudy flix; it stayeth also the ouermuch flowing of women's monethly sicknesses. The roote taken as aforesaid staieth vomiting, and healeth the inflammation and sorenesse of the mouth and throat; it likewise fastneth loose teeth, being holden in the mouth for a certaine space and at sundry times."

The large quantity of starch which the root contains also renders it nutritive; and hence when roasted it is eaten in Siberia and Iceland. According to Curtis and Withering, the shoots and leaves were used about Manchester, for greens, under the name of Patience Dock. It is probable, however, that the name Patience Dock has been incorrectly applied to this plant from its having been confounded with the true Patience Dock (*Rumex Patientia*),

which was formerly cultivated in this country, and eaten as a pot-herb. But since the time of Gerarde, the young shoots and leaves of Bistort have been used in the North of England as a pot-herb under the name of Passions; which name is probably derived from the plant being in perfection for such a purpose about Easter. Miller also says, "The young shoots are eaten in herb puddings in the North of England, where the plant is known by the name of Easter Giant."

Per. Mat. Med., vol. ii, pt. 1, p. 503; Gerarde's Herball, by Johnson, 1636, p. 399; Steph. and Church., Med. Bot., by Burnett, vol. i, pl. 48; Lewis, Mat. Med., p. 154; Cullen's Mat. Med., vol. ii, p. 40; Miller's Gard. Dict., by Martyn (1807), vol. 2, pt. 1.

DESCRIPTION OF PLATE.

Drawn from a plant grown in Kew Gardens.

1, 2, 3. The whole flowering stem and root-stock.
4. Diagram of flower.
5. A flower.
6. Vertical section of the same.
7. A fruit.
8. Vertical, and—9. Transverse section of the same.

(5—9 enlarged.)

D.Blair ad. nat. del et lith.

MYRISTICA FRAGRANS Houtt.

M&N.Hanhart imp.

N. Ord. MYRISTICACEÆ. Lindl., Veg. K., p. 301; Le Maout & Dec., p. 650; Baill., Hist. Pl., ii.

Genus **Myristica**,* *Linn.* A. DC., in DC. Prod., xiv, p. 189. Species over 80, all tropical, and mainly Asiatic, but some American and a few Australian.

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218. Myristica fragrans, *Houttuyn, Hist. Nat.*, ii, *pt.* 3, *p.* 233 (1774).

Nutmeg.

Syn.—M. moschata, *Thunb.* M. officinalis, *Linn. f.* M. aromatica, *Lam.*

Figures.—Woodville, t. 238; Roxburgh, Pl. Coromandel, t. 274, cop. in Hayne, ix, t. 12; Nees, t. 133; Bot. Mag., 2756, 2757, cop. in Steph. & Ch., t. 104; Berg & Sch., t. 13 a; Hook., Exotic Bot., tt. 155, 156; Blume, Rumphia, t. 55; A. DC., in Fl. Bras., fasc. 25, t. 38; Baill., ii, figs. 298–306.

Description.—A small evergreen tree 25—40 feet high when full grown, with numerous spreading branches covered with greyish-brown rather smooth bark; younger branches green. Leaves alternate, shortly petiolate, without stipules, somewhat convex above, 4—6 inches long, ovate or oblong-ovate, acute at both ends, entire, smooth, strongly veined, dark green, paler beneath. Flowers diœcious: in small axillary racemes of 2—6 flowers, in the female tree sometimes solitary; pedicels slender, drooping, with a single, quickly deciduous, rounded bract just below the flower. Perianth about $\frac{3}{8}$ inch long, fleshy, bell-shaped or urceolate, nearly smooth, pale yellow, cut into 3 (rarely 4), spreading or erect, triangular, acute teeth, æstivation valvate. Male flowers:—Stamens combined into a central fleshy column, about as long as the tube of the perianth, with about 6—10 linear, 2-celled anthers occupying its upper two-thirds and opening longitudinally. Female flowers:—Ovary superior, one-celled, with a single erect anatropous ovule, a little shorter than

* *Myristica*, from μυριστικός, suitable for an ointment (μύρον); a mediæval name for the "nut."

the perianth, broadly ovate, acute at the apex and terminating in two persistent stigmas. Fruit pendulous, about 3 inches long by 2 wide, having much the external appearance of a small pear, but grooved by a longitudinal furrow which passes through the somewhat lateral apiculus marking the position of the stigmas, smooth, yellow; pericarp nearly ½ inch thick, tough and fleshy, yellowish-white, dehiscing from above along the furrow into two equal valves, and containing a single erect seed which completely fills the cavity, out of which it readily falls when ripe. Seed about 1¼ inch long, broadly ovoid, blunt, closely enveloped and almost completely covered by an irregularly cut, fleshy arillus ("mace"), which is cup-shaped round the basal hilum, and much folded over the top of the seed, brilliant scarlet when fresh, but yellow and brittle when dry; testa very hard and thick, dark brown, smooth and shining, marked with impressions from the tightly appressed arillus; inner seed-coat thin, membranous, pale brown; nucleus of the seed ("nutmeg") wrinkled externally, mainly consisting of the abundant endosperm, which is rather soft but firm, whitish, and marbled with numerous reddish-brown vein-like partitions, into which the inner seed-coat penetrates (ruminated); embryo at the base near the hilum; radicle small; cotyledons foliaceous, laciniated.

Habitat.—The nutmeg tree is a native of the Moluccas and other Indian islands, Amboyna, Bouro, New Guinea, &c., preferring a light soil, shade, and a moist atmosphere. Its cultivation is successfully carried on chiefly in the same islands, and especially in the small volcanic Banda group where the tree was first discovered, but also in the Philippines, Bencoolen, Penang, and Singapore, as well as in Mauritius, the West Indies, and South America. The plant was first introduced into our stoves in 1795 by Sir Joseph Banks, and specimens are now to be seen in several botanic gardens. Male trees are said to be much more frequent than female.

A. DC., in DC. Prod., xiv, p. 189; Hook. f. and Thomson, Fl. India (1855), i, p. 154; Miquel, Fl. Ind. Batav., i, 2, p. 53; Lindl., Fl. Med., p. 21.

Official Parts and Names.—1. Myristica, *Nutmeg;* the kernel of the seed of Myristica officinalis, *Linn.*: 2. Oleum Myristicæ, *Volatile Oil of Nutmeg;* the oil distilled in Britain from Nutmeg: 3. Oleum Myristicæ Expressum, *Expressed Oil of Nutmeg;* a concrete oil obtained by means of expression and heat from nutmegs (B. P.). The kernel of the fruit (*Myristica*) of Myristica officinalis, *Linn.* (I. P.). 1. Myristica; the kernel of the fruit of Myristica fragrans, *Houttuyn*: 2. Oleum Myristicæ; the volatile oil obtained from the kernels of the fruit: 3. Macis; the arillus of the fruit.

1. Myristica. *The Nutmeg.—Collection and Preparation.* At Bencoolen the nutmeg tree bears all the year round, but more plentifully in some months than in others. But the great harvest is generally in the four last months of the year, and there is a smaller one in April, May, and June. The fruit when ripe splits open spontaneously on one side, and is gathered by means of a hook attached to a long stick; the pericarp is then removed from the solitary seed, after which the aril (*mace*) is carefully stripped from the other parts of the seed (*nut*), and the mace and the nut are then separately prepared for the market.

The mace will be described hereafter under the head of Macis; we now allude to the preparation of the nutmeg only. For this purpose the nuts are taken to the drying house, placed on hurdle-like frames, and smoke-dried for about two months by the smouldering heat of a wood fire at a temperature not exceeding 140°, and with suitable arrangements for a proper circulation of air. The nuts are turned every second or third day, and when thoroughly dried, the kernels, which are the nutmegs of commerce, rattle in their shell. The shells are then cracked with wooden mallets, the worm-eaten and shrivelled kernels are rejected, and the good ones picked out and rubbed over with well-sifted dry lime. The nutmegs are then finally packed for exportation in tight casks, the insides of which have been smoked, and covered with a coating of fresh water and lime. Nutmegs are prepared by the Dutch in the Banda Islands in a nearly similar way, but before being smoke-dried they are first

sun-dried for a few days; and when thoroughly dried as above described on hurdle-like frames, they are prepared for the market by dipping them in a mixture of salt water and lime, and afterwards spreading them out on mats for four or five days in the shade to dry. The first process is regarded as the best. In the Banda Islands the smaller nutmegs are reserved for preparing the expressed oil. The practice of liming nutmegs originated with the Dutch, who by thus destroying the vitality of the seed endeavoured to limit the cultivation of the nutmeg tree to their own possessions in the Banda Islands and Amboyna. The process of liming nutmegs having thus become an established custom is still very extensively followed, for although in this country we prefer the *unlimed nutmegs*, these are scarcely saleable abroad. The best mode of preserving nutmegs would be in their natural shell (*nutmegs in the shell*), but they are rarely seen in this state in Europe or America, although preferred as thus prepared by the Chinese.

General Characters, Varieties, Commerce, and Composition.— The nutmeg, which, as we have seen, is the dried nucleus or kernel of the seed, is oval or roundish in shape; it varies in size, but rarely exceeds 1 inch in length by about $\frac{4}{5}$ of an inch in breadth; and averages about $\frac{1}{4}$ of an ounce in weight. The largest nutmegs are to be preferred. The colour of the unlimed nutmeg is greyish-brown, and hence this is called the brown nutmeg; that of limed nutmegs is brown in the projecting parts, and white from the presence of lime in the depressions. All nutmegs are smooth to the touch, marked externally with reticulated furrows, and have a greyish-red colour internally, varied with darker brownish-red veins from the projection inwards of their inner seed-coat (*endopleura*), so that the transverse section has a marbled appearance. Their odour is strong and pleasantly aromatic, and their taste agreeably aromatic, warm, and bitterish.

Several commercial varieties of nutmegs are known in the markets. These are distinguished from their geographical sources, as Dutch or Batavian, Sumatra, Penang, Singapore, Java, &c. The most esteemed, and those commonly distinguished till

recently in the London market, were the Penang, Dutch, and Singapore, but in consequence of the destruction of the nutmeg trees in Penang and Singapore some years since, nutmeg cultivation in these islands has considerably decreased of late years, in fact, at one time, had entirely ceased. Penang nutmegs are always unlimed and hence most esteemed in this country, Dutch or Batavian are limed, and Singapore are commonly unlimed, and of inferior quality. By far the largest supplies of nutmegs are derived from the Banda Islands; these are all at first shipped to Batavia. The quantity of nutmegs imported annually into the United Kingdom is probably about 560,000 lbs., and into the United States not less than 500,000 lbs.

Besides the true or official nutmeg as just described, another but very inferior nutmeg, which is the produce of *Myristica fatua*, Houtt., is also sometimes met with in commerce. It is commonly distinguished as the *long nutmeg*, from its greater length as compared with the true nutmeg, which is frequently called the *round nutmeg*.

The principal constituents of nutmegs are *fat*, forming about 28 per cent., and which is described below under the name of Oleum Myristicæ Expressum, and from 2 to 3 per cent. of *volatile oil*, which is also described below under the official name of Oleum Myristicæ. Nutmegs also contain *starch*, *albuminoid matter*, and other unimportant constituents.

Medical Properties and Uses.—Nutmeg possesses like the other spices, aromatic, stimulant, and carminative properties; but in large doses it is narcotic, producing effects, it is said, similar to those of camphor. It has been used with advantage in mild cases of diarrhœa, flatulent colic, and certain forms of dyspepsia; but in medicine it is principally employed as an adjunct to other remedies, in order to cover their taste or to correct their unpleasant operation.

The principal consumption of nutmegs is, however, as a condiment. Used in this way they serve to flavour food substances, and by their stimulant properties to assist their digestion. But on account of their narcotic qualities they should be employed with

caution by those subject to apoplexy or other cerebral affections.

2. Oleum Myristicæ. *Volatile Oil of Nutmeg.* — This is obtained by distilling powdered nutmegs with water, the produce varying commonly from 2 to 3 per cent. It is to this oil that the odour and taste of nutmegs are principally due. It is colourless or pale straw yellow, soluble in both alcohol and ether, having a sp. gr. which is variously stated at between 0·920 and 0·948; and it is principally composed, according to Cloëz, of a hydrocarbon, which boils at 329°, and which Gladstone has termed *Myristicene.* Gladstone found in the crude oil an oxygenated oil, to which he has given the name of *Myristicol;* this is isomeric with Menthol, already noticed under the head of *Mentha piperita,* and which has the odour of nutmeg. Oil of nutmeg is dextrogyre.

The crystalline stearoptene, which is sometimes deposited from oil of nutmeg, is termed by John *Myristicin;* it is probably the same as Myristic acid, which is noticed below under Oleum Myristicæ Expressum.

Volatile oil of nutmeg is carminative and stimulant like the ordinary nutmeg, and may be used for similar purposes.

3. Oleum Myristicæ Expressum. *Expressed Oil of Nutmeg. Nutmeg Butter. Oil of Mace.*—This is commonly obtained by first reducing nutmegs to a coarse powder, which is then placed in a bag and exposed to the vapour of water, and afterwards subjected to pressure between heated plates. The oil which is thus obtained is at first liquid, but it becomes solid as it cools. Flückiger and Hanbury say that nutmegs yield about 28 per cent. of oil when thus treated; but commonly they are said to yield only about half this amount.

This oil is chiefly obtained from Singapore, and is usually found in oblong cakes about 10 inches long by 2½ square, enveloped in palm leaves. It is a solid unctuous substance of an orange-brown or orange-yellow colour, more or less mottled, and with the odour and taste of nutmeg. When pure it is soluble in about four parts of warm alcohol, or in two of warm ether. It

is composed of about 6 parts of the volatile oil of nutmeg already described, and several fatty bodies, the more important of which has been termed *Myristicin* or *Myristin*, which by saponification yield *Myristic Acid* and *Glycerine*.

Expressed oil of nutmeg is a useful stimulant application in chronic rheumatism, paralysis, and sprains, for which purpose it may be advantageously combined with Soap Liniment. It is an ingredient in the Pitch Plaster and Warm Plaster of the British Pharmacopœia.

4. Macis. *Mace.* — This substance is only official in the Pharmacopœia of the United States. As already noticed mace is the aril of the seed. After being stripped from the nut in the manner previously described, it is prepared for the market by being dried in the sun; or in rainy weather by artificial heat. It is then commonly sprinkled by the Dutch with salt water, with the view of contributing to its preservation. Mace is principally derived from the Banda Islands, and is received indirectly from Java and Sumatra.

Mace occurs in pieces, which are generally called *blades*. These are flat, smooth, irregularly slit, slightly flexible or brittle, somewhat translucent, exuding oil on pressure of a reddish or orange-yellow colour, and resembling nutmegs in odour and taste. Before being dried mace has a brilliant red hue, but this it commonly loses in drying.

The mace of the long nutmeg is very inferior, being dark coloured, very brittle, and with but little taste and odour.

The essential constituents of mace are from 6 to 9 per cent. of a *volatile oil* which closely resembles the volatile oil of nutmeg, and, according to Flückiger and Hanbury, of about 24·5 per cent. of a balsamic substance consisting of resin and semi-resinified essential oil.

The properties and uses of mace are essentially the same as those of the nutmeg, but it is comparatively little employed in medicine; its principal consumption is as a condiment.

Per. Mat. Med., vol. ii, pt. 1, p. 472; Pharmacographia, p. 453; U. S. Disp., by W. and B., pp. 569 and 604; Steph. and

Church., Med. Bot., by Burnett, vol. ii, pl. 104; Lumsdaine, in Pharm. Journ., vol. ii, 1st ser., p. 516; Crawfurd, Dict. Indian Islands, 1856, p. 304; The Malay Archipelago, by Wallace, vol. i, p. 452; Seemann, in Hooker's Journ. Bot., vol. iv (1852), p. 83; Collingwood, in Journ. Linn. Soc., vol. x (Bot.), p. 45; Gmelin's Chem., vol. xiv, p. 389, and vol. xvi, p. 209; Journ. de Pharm., Fev., 1864, p. 150; Royle's Mat. Med., by J. Harley, p. 464.

DESCRIPTION OF PLATE.

Drawn from a male plant in Kew Gardens; the female flower added from Roxburgh.

1. A branch with flowers.
2. Section of male flower.
3. Column of stamens.
4. Section of the same.
5. A female flower opened.
6. Fruit bursting open.
7. The same with one valve removed, showing the seed.
8. Section of seed.
9. Seed with the testa removed.

(2—5 enlarged.)

D.Blair, ad nat. del. et lith.

M & N.Hanhart imp.

CURCUMA LONGA, *Linn.*

N. Ord. ZINGIBERACEÆ.

Genus Curcuma,* *Linn.* Endlicher, Gen. Plant, p. 223. Species about 25, natives of the tropical East Indies.

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269. Curcuma longa, *Linn., Sp. Plant., ed.* 1, *p.* 2 (1753).

Turmeric.

Syn.—Amomum Curcuma, *Jacq.* Curcuma rotunda, *Linn.*

Figures.—Woodville, t. 252; Rheede, Hort. Malab., xi, t. 11; Jacq., Hort. Vindob., iii, t. 4; Bot. Register, xi, t. 886.

Description.—A perennial herb with a permanent, irregularly rounded or ovate root-stock, which gives off lateral, elongated, cylindrical branches, wrinkled externally, often swelling into fusiform tubercles and emitting numerous roots, when mature brownish externally, deep yellow or orange on section. Leaves all radical, convolute in vernation, when full grown over three feet long, including the long, rather slender petioles which sheath at the base, obovate-lanceolate or -oval, very acute at the apex, gradually attenuated into the petiole, entire, smooth, thin, bright uniform green; midrib very strong and prominent beneath; the lateral nerves slender, close, nearly straight, coming off the midrib at a very acute angle. Flowering stems from the centre of the tuft of leaves, and appearing before the latter are full grown, about a foot high including the inflorescence which occupies about half its length, cylindrical, stout, solid, pale green, with a few pale sheathing bracts, the upper one larger and somewhat leafy. Flowers sessile, usually in pairs, in the axils of large, concave, spreading bracts, and exceeding them, imbricated in a rather dense spike; the lower bracts ovate, blunt, saccate at the base, pale green, sometimes tinged with purplish red; the upper ones empty, forming a terminal tuft (coma), narrower, undulated, white tinged with bright pink (brighter before the inflorescence

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* *Curcuma* is said to be "from the Persian *Kurkum*, a name applied also to Saffron."

has expanded), each flower provided with 2 small, ovate, scaly bracts at the base. Calyx superior, very short, funnel-shaped, bluntly 3-lobed, membranous, gamosepalous, yellowish. Corolla gamopetalous, consisting of an infundibuliform tube more than twice the length of the calyx, and three ovate-lanceolate, acute, erect, rigid, orange-coloured segments, about as long as the tube, the posterior slightly hooded, rather larger than the two lateral ones, which are approximated in front. Androecium of 6 portions in two rows; the three outer petaloid, bright yellow (often described as an inner series of corolla-segments) arising from the summit of the tube of the corolla, the two lateral equal, obovate-oblong, bifid or lobed at the end, overlapping the anterior one, which forms the lip of the flower, and is rounded, deeply bifid, and spreading; the three inner not petaloid, the two lateral reduced to two small filiform staminodes inserted at the very base of the corolla-tube, the posterior one antheriferous, with a broad filament inserted on the corolla-tube between the two lateral staminodes of the outer row and opposite and at the base of the posterior corolla-segment. Anther distinctly two-celled, oblong, tailed at the base, minutely hairy outside, introrse, connective prolonged into a short beak curved over above the anther. Ovary inferior, globose, 3-celled, with numerous ovules in several rows; style very long, slender, the upper part passing between the lobes of the anther and concealed by them; stigma capitate, standing immediately above the anther and beneath the process of the connective. Fruit not seen: of the genus, a dry 3-celled capsule, loculicidally 3-valved, with numerous seeds; the seeds roundish, with a short arillus and a small straight embryo, with the radicle exserted beyond the radiated endosperm.

Habitat.—This handsome plant is cultivated extensively about Calcutta and throughout Bengal; also in Ceylon, many of the East Indian Islands, and the Fijis. We have seen a specimen from the Cape of Good Hope. Its native country is probably some part of the Indian peninsula, but cannot now be determined. It was introduced into our stoves so long back as 1759 by P. Miller, and may be seen in most botanic gardens; it flowers

in the early summer. We have not met with any account of the fruit.

Many species of this fine genus are figured in Roscoe's great work on the *Scitamineæ*, but the present is not included in it. *C. aromatica*, Salisb. (*C. Zedoaria*, Roxb. non Rosc.), is the subject of an excellent plate in Berg & Schmidt, t. 34 a.

Retzius, Observ. Bot., fasc. iii, p. 72 (1783); Roxb., Fl. Indica, i, p. 32; Seemann, Fl. Vitiensis, p. 291.

Official Part and Names.—Turmeric; the rhizome (B. P. *Appendix*). The Root-stock or Tubers (*Curcuma, Turmeric*) (I. P.). Curcuma; the rhizome (U. S. P. *Secondary*).

General Characters, Varieties, and Composition.—There are two sorts of turmeric seen in commerce—the *round* and the *long*, but both are the produce of the same plant; the central rhizomes or root-stocks constituting the round, and the lateral or secondary rhizomes (*tubers*) the long; the latter are the more abundant. The *former* are roundish or somewhat ovate, usually from about one inch and a half to two inches in length, and one inch in diameter, pointed at one end, and marked externally with annular ridges. They are often found cut into halves. The *latter* are somewhat cylindrical, more or less curved, pointed at the two extremities, frequently having on their sides one or more short knobs or shoots, about the thickness of the little finger, two or three inches long, and marked externally with annular ridges. Both sorts are yellowish externally, very hard and firm, and when broken having a waxy-resinous appearance, and an orange-yellow or reddish-brown colour. The powder is orange yellow. Turmeric has an aromatic taste and odour somewhat resembling ginger, but peculiar. When chewed it tinges the saliva yellow.

There are several varieties of turmeric known in commerce, as China, Bengal, Madras, Bombay, Java, and Cochin. The latter variety is the produce, however, of another species of *Curcuma*. The China kind is the most esteemed, but is rarely met with in Europe. The Java is of low commercial value. A rhizome called "African Turmeric" has also been described by Dr. Daniell,

which resembles in appearance and properties the other kinds of commercial turmeric. It is said to be the produce of *Canna speciosa* of Roscoe, but this requires further investigation.

Turmeric contains about one per cent. of a *volatile oil* to which its odour is due, some *starch*, a yellow colouring matter called *curcumin*, and other unimportant substances. The alkalies change the colour of curcumin to reddish brown; and boracic acid produces an orange tint; hence paper tinged with tincture of turmeric is largely employed as a test of the presence of alkalies.

Properties and Uses.—Turmeric is not now used as a remedial agent; but is introduced into the pharmacopœias as a test of the presence of alkalies, its action on which has just been noticed. For this purpose the British Pharmacopœia directs unsized white paper to be steeped in tincture of turmeric, and dried by exposure to the air.

Turmeric is also employed as a condiment, and is a constituent of the well-known Curry Powder, and of many other articles of Indian cookery.

Turmeric is likewise used for dyeing wool, silk, &c., but the colour, though a fine yellow, is not durable. It is also occasionally employed in pharmacy in colouring ointments and other preparations.

Curcuma Starch. East Indian Arrowroot.—The starch known under the names of *Curcuma Starch*, *Tikor*, and *East Indian Arrowroot*, and which is a favorite article of diet among the natives in some parts of India, is obtained from the colourless rhizomes of certain species of *Curcuma*, but principally of those of *C. angustifolia*, Roxb., and *C. leucorrhiza*, Roxb. Its properties are similar to those of West Indian Arrowroot or Maranta starch. It is sometimes met with in this country, but the starch commonly sold here as East Indian Arrowroot is Maranta starch.

Per. Mat. Med., vol. ii, pt. i, pp. 237 and 240; Pharmacographia, pp. 574 and 578; U. S. Disp., by W. and B., p. 357; Journ. Chem. Soc., vol. xi (1873), p. 504; Drury, Useful Plants of India, 1873, 2 edit., p. 168; Pharm. Journ., vol. i, 2nd ser., p. 258.

DESCRIPTION OF PLATE.

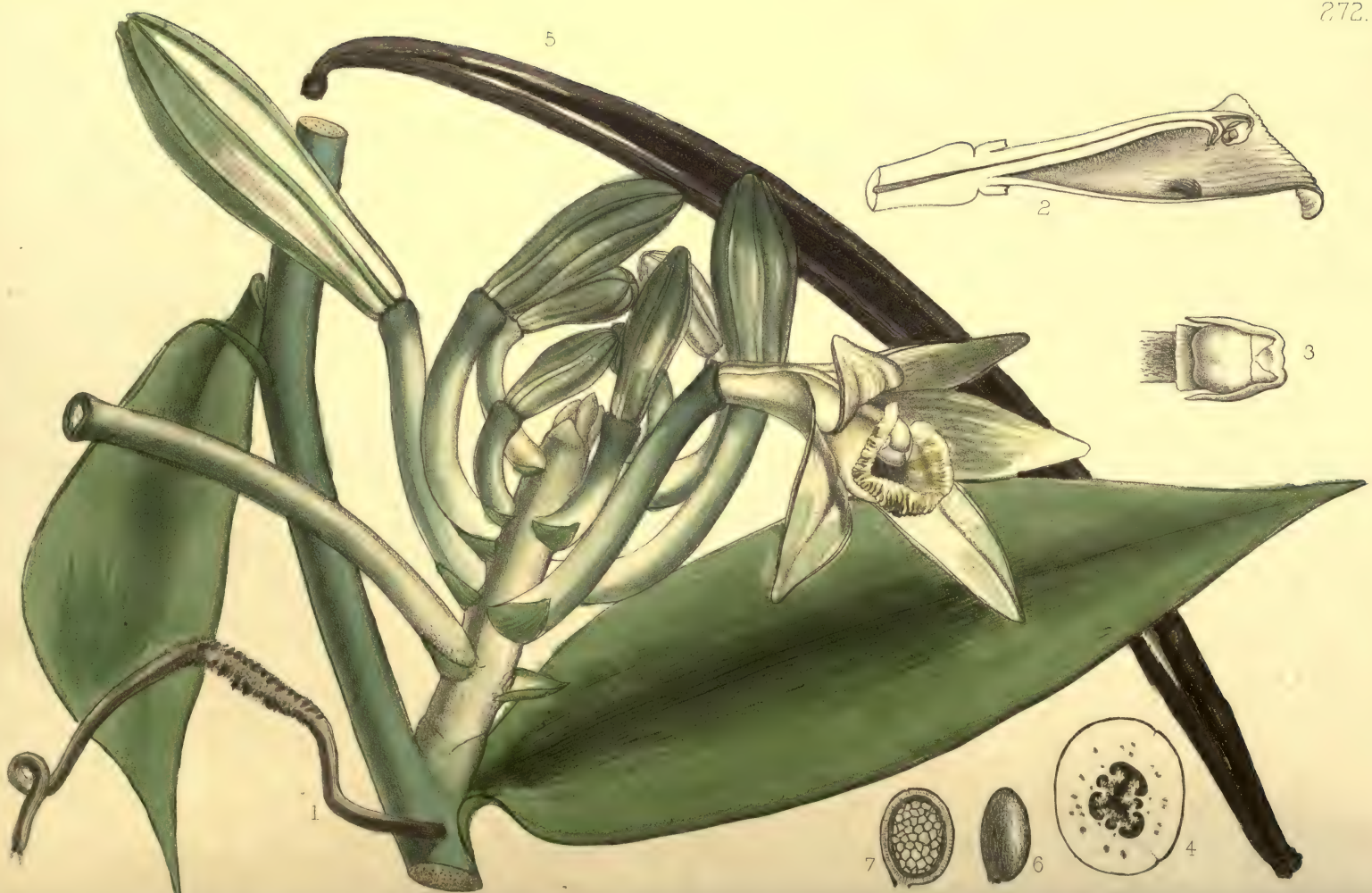
Drawn from a specimen in the Royal Gardens, Kew.

1. Base of a young plant showing early condition of the rhizome-branches.
2. Flowering stem with spike of flowers.
3. Upper part of leaf before expansion.
4. Vertical section of flower to show fertile stamen and two lateral petaloid staminodes.

5, 6, 7. Front, side, and back view of anther.

8. Transverse section of ovary.
9. Vertical section of the same, also showing the two filiform staminodes.

(5–9 enlarged.)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N. Ord. Orchideæ. Lindl., Veg. K., p. 173; Le Maout & Dec., p. 769.

Tribe *Arethuseæ*.

Genus Vanilla,* *Swartz.* Lindley, Orchidaceous Plants, p. 434. Species 12, natives of tropical America.

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272. Vanilla planifolia, *Andrews, Bot. Repository, t.* 538 (1808).

Vanilla. Baynilla (Mexico).

Syn.—V. claviculata, *Swartz.* V. sylvestris? *and* V. sativa, *Schiede.* V. viridiflora, *Blume.* Myrobroma fragrans, *Salisb.*

Figures.—Hayne, xiv, t. 22; Berg & Sch., t. 23 a, b; Bot. Rep., t. 538; Salisb., Parad., t. 82; Blume, Rumphia, t. 68.

Description.—A fleshy, somewhat succulent, dark-green perennial climber, adhering to trees by its aërial roots, which are produced from the nodes, 5 or 6 inches long, simple, and covered with hairs at the middle portion. Stem cylindrical, slender, solid, fleshy, smooth, dark green, branched, very long. Leaves alternate, sessile, 4—6 inches long, oval, attenuate at the apex, narrowed into the slightly sheathing base, persistent, thick and tough, dark green, slightly paler beneath, veins invisible. Flowers 2 inches across, pale yellowish-green, sessile, in lax axillary spikes of 8—10; axis fleshy, pale green, tapering; bracts short, triangular, green. Perianth fleshy, articulated with the ovary which looks like a stalk to the flower, deciduous, of 6 leaves in two rows, outer row (sepals) free to the base, nearly equal, erect and slightly spreading, lanceolate-oblong, acute, with a central rib, inner row (petals) alternating with the last, and the two lateral ones similar to them in size and form, the anterior (labellum) very different, concave, combined at the base with the column, and with it forming a somewhat funnel-shaped tube, margin faintly bifid, finely crenate, recurved on all sides and crisped, yellow, tube warted within the orifice, and furnished about halfway down with a crest of small, transversely-placed, flat, triangular scales,

* *Vanilla* is the diminutive of the Spanish *vaina*, a pod.

attached by one angle close behind one another, and pointing backwards, but easily elevated or depressed. Androecium and style fused into the column, which is elongated, 1½ inch long and tapering, occupying the posterior part of the flower, hairy below, and perforated throughout its length. Fertile anther solitary, supported on a flat horizontal prolongation of the column, which is bent over at the extremity, and hooded with 2 lateral processes (staminodia ?), pollen granular, in two pollen-masses (pollinodia) enclosed in a membranous pouch, each 2-lobed. Ovary inferior, 2 inches long, cylindrical and stalk-like, fleshy, 1-celled, with 3 pairs of parietal placentæ bearing very numerous minute ovules. Style fused with the column, with a central canal which expands at the orifice into a horizontal chink below the anther, from which it is completely cut off by its flat, truncate, deflexed, upper lip, lower lip of the chink shorter, also reflexed. Fruit a fleshy, slender, bluntly trigonous, curved pod, 5—8 inches long; pericarp smooth, longitudinally striate, dehiscing loculicidally from the apex more than halfway down into 2 unequal valves; cavity 1-celled, somewhat triangular, with the pairs of placentæ projecting from each side, each branched into two recurved lobes, and bearing innumerable minute seeds, imbedded in a slimy juice, the rounded angles lined with a layer of microscopic unicellular secreting hairs. Seeds very small, lenticular, oval in outline, hard, black, opaque, without any investing sac; testa rather thick, crustaceous, marked with shallow reticulations, embryo filling the seed, without a clear differentiation of the parts.

Habitat.—This singular plant is found wild in the hot moist woods of several states of south-east Mexico, climbing and epiphytic on forest trees; it is also extensively cultivated in the same country, especially in the province of Vera Cruz. Vanilla is also grown to a large extent in Mauritius, Bourbon, Madagascar, and Java. It was introduced into England about 1800 by the Marquis of Blandford, and grows vigorously in our hothouses, flowering sparingly in April and May. As with other orchids, fertilisation is, no doubt, naturally brought about by insects, though the precise mode has not yet been seen; it may, however,

be artificially effected after first cutting off or raising the upper lip of the stigmatic orifice; fruit is thus produced without difficulty, and is said to be equal in size and aroma to the best Mexican examples. According to Morren it takes "exactly a year and a day to ripen."

Vanilla differs so much from *Orchideæ* generally that Lindley at one period considered it the type of a special order, *Vanillaceæ* (see Nat. Syst., ed. 2, p. 341). It is the only genus of orchids with the fruit opening by two valves which separate from one another at the top. The whole structure was figured by Francis Bauer so long ago as 1807, and his fine drawings (now in the British Museum) are indifferently reproduced in the book quoted below (tt. 10, 11). The structure of the secreting hairs which line the angles of the fruit-cavity is shown in Berg and Schmidt's plate before referred to.

Lindl., Orchid. Plants, p. 435; Morren, in Ann. Nat. Hist., iii (1839), p. 1; Bauer and Lindl., Illustr. Orchid. Plants; Lindl., Fl. Med., p. 579.

Official Part and Name.—VANILLA: the prepared unripe fruit of Vanilla aromatica (U. S. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of India. But it was official in the London Pharmacopœia of 1721.

Collection and Preparation.—The preparation of vanilla seems to vary in different places. The fruits (pods) are collected before they are quite ripe, that is usually, when their green colour begins to disappear. They are then either dried in the shade and afterwards covered with a coating of oil; or, according to De Vriese, they are dried by exposing them to heat alternately uncovered and wrapped in woollen cloths. They are then tied together in small bundles, and these are afterwards commonly surrounded either by sheet lead or enclosed in small metallic boxes, and thus sent into the market. The object sought to be obtained in their preparation is not alone their preservation, but the full development of their odour, which appears to be due to chemical changes which take place in the fruit during and after its preparation for the market.

General Characters, Varieties, and Composition.—The vanilla of commerce occurs in the form of fleshy, cylindrical, somewhat flattened, flexible, stick-like fruits, varying in length from 4 to 8 inches, and in thickness from about $\frac{1}{3}$ to $\frac{1}{2}$ an inch. The fruits taper in some degree towards their extremities, and are more or less bent at their base. Externally they present a dark brown or blackish colour, and a greasy shining surface, which is finely furrowed in a longitudinal direction, and often covered with an efflorescence of small whitish crystals. Each fruit is commonly split into two unequal parts (valves), and exhibits in its interior a multitude of very minute, hard, glossy, black seeds, imbedded in a soft, thick, brownish-black, oily pulp. Vanilla has a strong, peculiar, very agreeable, aromatic odour, and a warm, sweetish, aromatic taste. The interior portion is the most fragrant.

There are several varieties of vanilla found in commerce, as *Mexican* or *Vera Cruz, Bourbon, Mauritius, Java, La Guayra, Honduras, Brazilian*, &c. The finest kind is Mexican Vanilla; of which, however, we have different qualities, and its production has much declined of late years. These varieties of vanilla are doubtless derived from different species of *Vanilla;* the finest vanilla, such as the Mexican, is commonly said to be the produce of *Vanilla planifolia,* the species now under description. The official plant is, however, as already noticed, *Vanilla aromatica,* Swartz.

The delicious fragrance of vanilla is due to a peculiar substance, called *Vanillin* or *Vanillic acid,* which exists in the proportion of about 1 per cent. Vanillin is frequently found in the form of minute crystals in the surface of, or inside, the fruit; or it is dissolved in the viscid oily pulp in which the seeds are imbedded. When pure vanillin is in the form of hard, colourless, 4-sided, acicular prisms, with a vanilla odour, and somewhat pungent taste. It is very soluble in alcohol, ether, and the fixed and volatile oils; and its solutions feebly redden litmus. It is soluble with difficulty in cold water; but it dissolves in 11 parts of boiling water, but is again deposited on cooling. Vanillin fuses at about 180°, and may be sublimed unchanged. Vanillin has recently been

formed artificially by Tiemann and Haarmann, at Berlin, who regard it as the methylic aldehyd of *protocatethuic acid*. The other constituents of vanilla possess no special importance.

Medical Properties and Uses.—Vanilla is an aromatic stimulant, with a tendency towards the nervous system. It has also been regarded as an aphrodisiac. It has been employed as a remedy in hysteria, low fevers, impotency, &c. ; but its use as a medicine is obsolete in this country, although still sometimes employed on the Continent and elsewhere. It is also frequently used for flavouring certain medicines, as lozenges and mixtures, in the United States, &c.

The principal use of vanilla is in perfumery; and for flavouring chocolate, various articles of confectionery, as ices, creams, &c., liqueurs, and other substances.

Per. Mat. Med., vol. ii, pt. i, p. 265; Pharmacographia, p. 595; U. S. Disp., by W. and B., p. 883; Journ. de Pharm., vol. xxxiv (1858), p. 401; Amer. Journ. of Pharm., Jan., 1866, p. 38; Stokkebye, in Wittstein's Vierteljahresschrift f. prakt. Pharm., vol. xiii (1864), p. 481; Journ. de Pharm., vol. xii (1870), p. 254.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Royal Gardens, Kew, flowering in May; with the fruit added.

1. Portion of stem with a spike of flowers.
2. Vertical section of the column and labellum.
3. Front view of end of column, showing anther and upper lip of stigma.
4. Transverse section of ovary.
5. A pod.
6. A seed.
7. Section of the same.

(2–4 enlarged; 6, 7 much magnified.)

D Blair ad viv del et lith

M & N Hanhart imp

VIOLA ODORATA ζ L

N. Ord. VIOLACEÆ. Lindl., Veg. Kingd., p. 338; Baill., Hist. Pl., iv; Le Maout & Dec., p. 240.

Tribe *Violeæ*.

Genus Viola,* *Linn.* B. & H. Gen., i, p. 117; Baill., l. c., p. 351. Over 200 species are described, principally natives of the temperate northern hemisphere, but some found in S. America, S. Africa, and Australia.

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25. Viola odorata, *Linn., Sp. Plant., ed.* 1, *p.* 934 (1753).

Sweet Violet.

Syn.—V. suavis, *Bieb.* V. imberbis, *Leighton.* V. alba, *Besser.*

Figures.—Woodville, t. 89; Hayne, iii, t. 2; Steph. & Ch., t. 29; Nees, t. 386; Berg & Sch., t. 16 b; Curt., Fl. Londin., fasc. 1; Syme, Eng. Bot., ii, t. 171; Baill., l. c., iv, figs. 363–6.

Description.—A small perennial herb with a short semi-subterranean rather fleshy stem (rootstock), the older part emitting fibrous roots, the upper younger portion still marked with the close circular scars of the leaves of former years, and giving off elongated, rather fleshy, leafless runners which root at the end and thus form independent plants. Leaves crowded on the upper part of the short stem (radical), involute before expansion, on long, cylindrical, very shortly hairy stalks, stipules semi-membranous, lanceolate, acute, with glandular cilia on the edge, blade 1—2 inches long (at the time of flowering), roundish-ovate, deeply cordate at the base, somewhat blunt at the apex, crenate-serrate at the margin, undulated, strongly veined, with very short hairs on the edges and veins, otherwise smooth, dark green. Flowers solitary, $\frac{1}{2}$—$\frac{3}{4}$ inch wide, on long, slender, axillary stalks (scapes) exceeding the leaves, with a pair of small linear-lanceolate bracts about or a little above their middle, and stiffly crooked at the ends so that the flowers nod. Sepals 5, oblong, blunt, slightly hairy on the edges, each produced backwards into a flat, blunt process, persistent. Petals 5, unequal, the odd one inferior, spreading, imbricate, obtuse, bluish-purple, the lowest one largest marked with dark veins and prolonged backwards into a short, blunt, nearly

* *Viola*, in Greek ἴον, the classical name for *V. odorata*, but also applied to a few other plants.

straight spur, the lateral ones with a tuft of hairs near the base. Stamens 5, hypogynous, alternating with the petals, filaments almost absent, anthers large, erect, introrse, 2-celled, dehiscing longitudinally, slightly coherent by their margins, the connective prolonged in all at the top to form a short triangular process, and in the two inferior ones also backwards to form laterally compressed oblong spurs which are received into the hollow spur of the inferior petal. Ovary conical, smooth, shorter than the stamens, 1-celled, with three parietal placentas with numerous ovules in several rows, style longer than the ovary, somewhat thickened upwards, curved downwards at its sharp point. Fruit a subglobose, pubescent, blunt capsule, $\frac{3}{8}$ inch in diameter, dehiscing loculicidally into 3 valves. Seeds numerous, small, roundish, smooth, with a short arillus or strophiole at one end, embryo straight in the axis of the fleshy endosperm.

Habitat.—A very familiar plant and a favourite in gardens. It has an extensive range, being found throughout Europe, including our own country (where, however, it is not considered to be wild in the north), Western Asia to Cashmere, Siberia and N. Africa. It was formerly cultivated for medicinal use at Stratford-on-Avon, but is not at the present time. The familiar flowers which appear in early spring are usually barren; those which produce fertile seed being apetalous and inconspicuous and formed later in the season; the leaves increase considerably in size after the spring flowers have faded: The white-flowered variety differs also in the want of the dark veins in the lower petal and the tufts of hair on the lateral ones (*V. imberbis*, Leight.).

Syme, E., Bot., ii, p. 14; Hook. f., Stud. Fl., p. 44; Watson, Comp. Cyb. Br., p. 107; Gr. & Godr., Fl. France, i, p. 177; Boiss., Fl. Orient., i, p. 458; Hook. f., Fl. India, i, p. 184; Ledeb., Fl. Ross., i, p. 249; Lindl., Fl. Med., p. 97.

Part Used and Name.—Viola; the recent petals or flowers. Not official in the British Pharmacopœia, or the Pharmacopœia of India, or the Pharmacopœia of the United States. But the

flowers were formerly official in the London, Edinburgh, and Dublin Pharmacopœias.

Collection, General Characters, and Composition.—Violet flowers should be gathered immediately they are expanded. When fresh they have a beautiful bluish-purple or deep violet colour, a very agreeable odour, and a slightly bitter taste. When carefully dried they retain their colour; but their odour is in a great measure lost. When chewed they tinge the saliva blue. They yield their properties to boiling water; and these may be preserved for some time by means of sugar in the form of syrup of violets.

The chief constituents of the flowers are an *odorous principle, blue colouring matter,* and *sugar.* Boullay also discovered in the root, leaves, flowers, and seeds of this plant, an alkaloid, resembling the *emetia* of ipecacuanha, which he termed *violine.* This alkaline principle was found by Orfila to be an energetic poison. It may probably prove to be identical with emetia.

Medical Properties and Uses.—Violet flowers possess slightly laxative properties, but they are very rarely used at the present day. The best form of administration is the syrup of violets, which may be given as a laxative to infants, in doses of half a teaspoonful to a teaspoonful or more, with an equal quantity of oil of almonds. Syrup of violets has also been used to give colour and flavour to other medicines.

Syrup of violets, as well as their aqueous infusion, also afford a very delicate test for acids and alkalies, being reddened by the former, and changed to a green by the latter.

On the Continent, the herbaceous parts of this and some other species of violet, more especially of *Viola tricolor,* the common Heartsease or Pansy, have been also employed for their mucilaginous, demulcent, and expectorant properties. The root and seeds are also emetic and purgative, which properties, as well as the expectorant action of the plant, are doubtless due to the presence of violine or violia.

Per Mat. Med., vol. ii, pt. 2, p. 573; Christison's Disp., p. 946; U. S. Disp., by W. & B., p. 898; Watts, Dict. Chem., vol. v, pp. 1000 and 1001; Steph. & Church., by Burnett, vol. i, pl. 29; Journ. de Pharm., vol. x, p. 23, and Jan., 1824.

DESCRIPTION OF PLATE.

From a specimen flowering in Kew Gardens in the spring; the fruit added from Berg and Schmidt.

1. Vertical section of the flower.
2. The androecium.
3. Fruit.
4. Transverse section of the same.
5. Vertical section, and—6. External view of the seed.

(1-6 enlarged.)

Viola pedata, *Linn.*

Bird's Foot Violet.

Official Part and Name.—The herb of *Viola pedata,* a common plant in the United States of America, was formerly official in the U. S. P. But in the U. S. P. of 1875 the root is alone official, as follows: — VIOLA, *Violet;* the root (U. S. P. *Secondary*).

General Characters, Composition, Medical Properties, and Uses.—The flowers, herb, and root of this plant possess analogous characters and properties, as the similar parts of *Viola odorata,* and may therefore be employed in like cases. Their chemical composition is also probably the same, although this has not been accurately determined.

U. S. Disp., by W. & B., p. 898.

D Blaue ad nat. del^t et lith.

M&N Hanhart imp.

N. Ord. CANELLACEÆ.

Genus Cinnamodendron,† *Endlicher*. B. & H., Gen., i, p. 121; Baill., Hist. Pl., i, p. 186; Miers, Contrib. Bot., i, p. 118. Species 2, one Brazilian, the other West Indian.

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27. Cinnamodendron corticosum, *Miers in Ann. Nat. Hist. ser.* 3, i, *p.* 350 (1858).

Red Canella, Mountain Cinnamon (Jamaica).

Figures.—Miers, Contrib. Bot., i, t. 24 b; Schnitzlein, Iconographia, t. 216*; Bot. Mag., t. 6120 (Sept., 1874); Fl. Brasil, fasc. 55, t. 105 (fruit).

Description.—A small tree 10—15 feet high, but growing sometimes to a far greater size (even it is said to 90 feet in height), with slender flexuose terete branches, and a smooth brownish-grey bark, marked with small orange lenticels. Leaves alternate, very shortly stalked, without stipules, oblong-lanceolate, 4 or 5 inches long by $1\frac{1}{4}$—$1\frac{3}{4}$ wide, acute at the base which is often unequal-sided, rather attenuate at the apex, entire, the margins somewhat reflexed, thick, smooth and shining on both sides, paler and very minutely pellucid-punctate beneath. Flowers about $\frac{1}{4}$ inch long, in small clusters of 1—4 in the axils of the leaves and scarcely exceeding the petioles, on short, slender, slightly pubescent pedicels. Sepals 3, imbricate, rounded, fleshy, slightly ciliate, yellowish-green, persistent. Petals in two rows, outer row 5, erect, concave, imbricate, oblong, blunt, fleshy, bright scarlet externally, orange and viscous within, the 2 outermost broader; inner row (corona, *Eichler*) 5 alternating with those of the outer row and somewhat shorter than them, narrowly spathulate-oblong, blunt, imbricate, thin, dotted with small transparent immersed glands. Stamens completely combined into a hypogynous, smooth, fleshy, cylindrical, pellucid-punctate tube about as long as the inner petals, anthers as in *Canella*, but some

† *Cinnamodendron*, Cinnamon-tree, in allusion to the qualities of the bark.

of the cells (normally 20) frequently more or less abortive, and thus varying in number, orange, dehiscing vertically. Pistil superior, cylindrical flask-shaped, smooth, surrounded at the base by a short, white, cup-shaped hypogynous disk; ovary large, 1-celled, with 5 (or 4) large and prominent parietal placentas, to which are attached numerous (about 60) uniform stalked ovules; style short and thick, slightly narrower than the ovary, extending just beyond the staminal tube; stigmas 5 (or 4) in a star round the capitate summit of the style. Fruit a smooth broadly ovoid berry $\frac{1}{2}$ inch long, somewhat tapering at the base, and supported by the persistent, thickened sepals, with a strong blunt point at its apex, 1-celled; pericarp thin, with the 5 (or 4) large dilated placentas projecting far into the cavity, and the 10—20 seeds (some abortive) densely packed and surrounded with mucilage. Seeds about $\frac{1}{10}$ inch long, somewhat reniform, compressed and slightly keeled, surface finely shagreened, bright brown, with the small hilum in the concavity, inner coat membranous, white; embryo very small, excentric, curved, near the surface of the copious rather fluid endosperm, radicle long, terete, near the hilum, cotyledons small.

Habitat.—This tree is confined to the island of Jamaica, where it seems to be local, growing in the higher mountain woods of S. John, S. Thomas in the Vale and Bath parishes. Though long known, this tree remained undescribed till less than twenty years ago, when Mr. Miers gave full and accurate botanical characters. It is stated in the 'Botanical Magazine' to grow also in the island of S. Thomas. Specimens have been in cultivation at Kew and the Botanic Society's garden for some years, and it flowered for the first time in the latter place in 1874.

In our description of the floral envelopes we have followed Miers and Eichler; the authors of the 'Genera Plantarum' consider the outer envelope as 3 bracts, and the "corona" as a corolla, our corolla being the calyx. The details of the 'Bot. Mag.' figure are incorrect, especially the ovary, which is represented as 3-celled.

The only other species of the genus is the Brazilian *C. axillaris*,

Endl., figured in 'Flora Brasiliensis' fasc. 55, t. 105; the bark of this is used locally in fevers, and called "Casca Paratudo."

Miers, Contrib. Bot., i, p. 121; Grisebach, Fl. W. Indies, p. 109.

Part Used and Name.—Cinnamodendron, *Spurious Winter's Bark;* the bark. It is not official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United States. The true Winter's Bark, obtained from *Drimys Winteri*, Forster, was official in the United States Pharmacopœia of 1850, and also in the Dublin Pharmacopœia of 1826.

General Characters and Composition.—This bark has been already referred to under the head of *Canella alba*, as the one long known and used in England and elsewhere for the true Winter's Bark, and therefore, as being probably the bark commonly referred to by writers, for which Canella Alba bark was formerly said to be substituted; hence it has been termed *Spurious Winter's Bark.* It is found in quills, which are commonly ten, twelve, or more inches in length, and one or two inches in diameter. It is covered by a thin corky outer coat, which has a dull reddish-grey or ferruginous-brown colour, and is marked with rounded depressions or scars. Internally it is yellowish-brown, reddish-brown, or of a deep chocolate colour. Its fracture is short and granular, but somewhat fibrous internally. It has an agreeable aromatic odour resembling cinnamon, and a very pungent taste, without any bitterness. Cinnamodendron bark may be readily distinguished from true Winter's Bark for which, as just noticed, it has been commonly substituted, both by its structural and chemical characteristics. Thus the latter is marked on its inner surface by very rough striæ, caused by the great contraction of the inner layer in drying, while the inner surface of the former is nearly smooth; and while a decoction of true Winter's Bark is not sensibly altered in colour by iodine, that of Cinnamodendron Bark is changed to a deep purplish-brown under the same circumstances.

Cinnamodendron bark may be also readily distinguished from Canella Alba bark, by the darker colour of its inner surface; and

by its decoction being blackened by a persalt of iron, which is not the case with that of Canella alba bark.

We have no proof of Cinnamodendron bark having been analysed, but amongst its constituents would appear to be *volatile oil* and *tannic acid.*

Medical Properties and Uses.—The true Winter's bark was formerly regarded as stimulant, tonic, aromatic, and antiscorbutic, and was employed in similar cases to canella alba and cinnamon barks. Its use is now nearly obsolete in Europe and the United States of America, although still much employed in South America as a remedy in diarrhœa, and other diseases.

Cinnamodendron bark has similar properties, and may be therefore used in like cases.

Per. Mat. Med., vol. ii, pt. 2, pp. 532 and 674; Christison's Dispensatory, 2nd ed., p. 402; Pharmacographia, p. 19; U. S. Disp., by W. & B., p. 1720; Guibourt, Drogues Simples, tome iii, p. 681.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Royal Botanic Society's Garden, Regent's Park, flowering in July; the fruit added from a Jamaica specimen in the herbarium of the British Museum; the bark from the Museum of the Pharmaceutical Society.

1. A branch with leaves and flowers.
2. A flower.
3. Vertical section of the same.
4. The staminal tube spread out.
5. The pistil.
6. Transverse section of ovary (the placentas should be larger).
7. Fruit.
8. Transverse section of a berry.
9. A seed.
10. Section of the same.
11. Piece of bark.

(2–6 and 8–10 more or less enlarged.)

D.Blair adsicc del et lith.

KRAMERIA TRIANDRA, *Ruiz et Pavon.*

N. Ord. POLYGALACEÆ.

Tribe *Krameriæ*.

Genus **Krameria**,* *Loefling*. B. & H., i, p. 140; Berg, in Bot. Zeitung, 1856, 745, &c.; Baill., v, p. 92. Species 20 or more, natives of the hotter parts of N. and S. America.

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30. Krameria triandra, *Ruiz & Pavon, Fl. Peruv.*, i, *p.* 61 (1798).

Ratanhia, Mapato, Pumacuchu (Peru).

Figures.—Ruiz & Pav., l. c., t. 93, cop. in Hayne, viii, t. 14, Nees, t. 413, Steph. & Ch., t. 72, and Woodville, vol. v; Berg & Sch., t. 3 f; Baill., l. c., figs. 116–121.

Description.—A low shrub with long decumbent branches and many spreading, bare, cylindrical twigs covered with a dark greyish-brown bark, when young hoary with erect silky hairs; root-crown large and thick, with very long cylindrical branches reaching $\frac{5}{8}$ inch in diameter and covered with a thick bark blackish-red outside and orange red within. Leaves alternate, irregularly scattered or crowded, sessile, $\frac{1}{2}$ inch long, obovate- or oblong-lanceolate, apiculate, entire, covered on both surfaces with longish, adpressed, silvery hairs, very dense and somewhat rufous on the young leaves and buds. Flowers rather large, at the extremities of short branches from the axils of the upper leaves, each with two small opposite leaves a little below the flower. Sepals 4, imbricate, spreading cross-wise, lanceolate, the two lateral ones smaller, externally densely silky, internally quite smooth, shining and scarlet. Petals 4, dissimilar, red, the two posterior in front of the posterior sepal, separate, thick, spathulate, acute; the two anterior small roundish, thick, concave and smooth within, scaly on the outside. Stamens 3, hypogynous, about half as long as the spathulate posterior petals and alternating with them, filaments fleshy, thickened upwards, red, anthers urceolate, 2-celled, opening at the top by a large circular orifice bordered with very short hairs; ovary ovoid-spherical,

* *Krameria*, dedicated to Dr J. G. H. Kramer, a Hungarian physician.

almost as long as the filaments, densely covered with bright white long silky hairs, 1-celled with two collateral pendulous ovules, style long, tapering, red. Fruit spherical, ¼ inch in diameter, leathery, covered with white silky hairs and beset with numerous slender tapering, brownish-red spines, about ¼ inch long, and with several barbed deflexed hooks at the end, indehiscent. Seed (not seen) solitary, ovoid, sharp at each end, embryo straight, in the axis of the endosperm, with a long radicle and small plane-convex cotyledons.

Habitat.—A native of Peru, where it grows in dry sandy places on mountain-slopes at 3000—8000 feet above sea-level in several provinces, and is especially abundant near the city of Huanuco. It flowers nearly all the year, but chiefly in October and November; the Spanish name is "Raiz para los dientes," from its use as a dentifrice. It has not been grown in England.

The very curious genus *Krameria* has been considered to form a distinct family by Kunth and by Lindley, and A. Gray has suggested placing it among the Leguminosæ Cæsalpineæ. Most authors, however, now concur in making it a very anomalous member of the Polygalaceæ. In the 'Genera Plantarum' the seeds are described as without albumen; we have not been able to examine a seed, but this was evidently very carefully done by Berg and Schmidt, and we have followed them in the above description.

Ruiz & Pavon, Fl. Peruv., i, p. 61; Berg, in Bot. Zeit., 1856, p. 766; Lindl., Fl. Med., p. 128.

Official Part and Names.—KRAMERIÆ RADIX, *Rhatany Root;* the dried root (B. P.). The dried root (*Krameriæ* vel *Rhataniæ Radix*) (I. P.) KRAMERIA; the root (U. S. P.).

In order to distinguish this kind of Rhatany from the other varieties noticed under the head of *Krameria Ixina,* it is termed *official rhatany;* or from the fact of its being imported from Peru, Peruvian or Payta Rhatany; or from its colour, *Red Rhatany.*

General Characters and Composition.—Peruvian, Payta, or Red

Rhatany root, as found in commerce, either consists of long, cylindrical, simple or branched pieces, which vary in thickness from $\frac{1}{4}$ to $\frac{1}{2}$ an inch, or more; or more frequently of a short thick portion which is generally much knotted, and as large as a man's fist, to which is attached a variable number of short, stumpy, more or less broken branches. The former is sometimes known as *long rhatany*, and the latter as *short* or *stumpy rhatany*; the first sort is preferred. These differences in the appearance of rhatany are caused by the varying modes in which the roots are collected. Thus if the root-diggers bestow the needful care in removing the roots from the soil, the long variety will be obtained; while if the roots are torn from the soil with force, the short or stumpy variety is the result. Rhatany root consists of a thin, readily separable bark, varying in thickness from about $\frac{1}{20}$ to $\frac{1}{10}$ of an inch, rough and scaly except in the smaller pieces, and of a dark reddish-brown colour externally, and bright brownish red on its inner surface; and of a very hard central woody portion, of a brownish- or reddish-yellow colour. The bark breaks with a somewhat fibrous fracture, is tough and difficult to powder, and has a strong, purely astringent taste. The wood is almost tasteless. When chewed rhatany root tinges the saliva red. Neither bark nor wood has any marked odour. The virtues of rhatany essentially reside in the bark, and hence the smaller pieces are to be preferred, as they have the largest proportion of bark.

The essential constituent of rhatany is a form of tannic acid, which is called *Rhatania-tannic Acid* or *Krameria-tannic Acid*. It was found by Wittstein in the bark in the proportion of about 20 per cent. It is closely allied to catechu-tannic acid. Rhatania-tannic acid is an amorphous powder; its solution affords a dark greenish precipitate with perchloride of iron, but it is not affected by tartar emetic. By the action of dilute acid it is decomposed into a crystallisable sugar and *Ratanhia-red*, which latter substance may also be found ready formed in the bark. No gallic acid is present in rhatany root.

Formerly an extract of rhatany was occasionally imported

from South America, and was official in the Dublin Pharmacopœia, but nothing definite is known about it, and it is not now to be met with, at least in Great Britain. It is interesting from the fact of Wittstein having discovered in it a crystalline body, which he regarded as identical with *tyrosine;* but other chemists, as Stadëler and Ruge, have described it under the name of *Ratanhin,* as according to them, it has a different composition to tyrosine.

Medical Properties and Uses.—The properties and uses of rhatany are similar to those of catechu; it is a powerful astringent, and like other agents of this class, tonic also. It has been found useful for internal administration in chronic diarrhœa, dysentery, menorrhagia, hæmaturia, and passive hæmorrhage from the bowels, &c.; as a gargle in relaxed sore throat; as an injection in leucorrhœa, and in fissures of the anus; and as an astringent wash to the mucous membrane of the eyes, nose, gums, &c.

The powder is also used as a dentifrice when mixed with equal parts of orris rhizome and charcoal, or with prepared chalk and myrrh.

The extract of rhatany as imported from South America, was formerly employed as an adulterant of port wine; and a strong tincture of the root in brandy is called wine colouring, and is said to be used in Portugal to give roughness to port wine.

Per. Mat. Med., vol. ii, pt. 2, p. 569; Christison's Disp., 2nd ed., p. 581; Pharmacographia, p. 74; U. S. Disp., by W. & B., pp. 514 and 1143; Gmelin's Chem., vol. xiii, p. 358; Journ. de Pharm. et de Chim., Jan., 1868, p. 73; Chem. Centralblatt, 1864, p. 1054.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected in Peru by Pavon. The root added from a pharmaceutical specimen. 1. A branch with flowers and fruit. 2. Front view of a flower. 3. Vertical section of a flower. 4. One of the anterior petals, 5. Fruit. 6. Section of the same. 7. One of the barbed spines. 8. Portion of the root. (2–4 and 7 enlarged.)

D.Blair ad nice del et lith.

M&N.Hanhart

KRAMERIA IXINA, L.

N. Ord. POLYGALACEÆ.

Tribe *Krameriea*.

Genus **Krameria**, *Loefling*.

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31. Krameria Ixina,* *Linn., Sp. Plant., ed.* 2, *p.* 177 (1762).

Syn.—K. tomentosa, *St. Hil.?* K. ovata, *Berg.* K. grandiflora, *Berg.*

Figures.—Hayne, viii, t. 13; Tussac, Fl. Antilles, i, t. 15; Fl. Brasil. fasc. 63, tt. 27 and 30 C, fig. 1 (*K. tomentosa*, St. Hil.).

Description.—A shrub with very numerous, slender, terete, erect or procumbent branches, shortly downy when young, bark dark brown. Roots long, cylindrical, covered with a thick separable bark, greyish-brown externally, dark reddish-brown within. Leaves alternate, scattered, nearly 1 inch long, lanceolate, tapering into a longish cylindrical petiole, acute and mucronate, strongly pubescent on both sides, 3-nerved, the upper ones narrower. Flowers numerous, arranged as in *K. triandra*, but forming more elongated lax racemes. Sepals ovate, rather blunt, dull red; petals 5, the 3 posterior spathulate, with the limb a little crisped, slightly connected at the base; stamens 4, alternating with the posterior petals; the rest as in *K. triandra*. Fruit as in the last species, but with the spines less than half as long.

Habitat.—This species in its extended sense has a large range; being found on dry barren ground in Mexico, the West Indian islands of Haiti and Antigua, Curaçao, New Granada, several parts of Venezuela, British Guaiana, and Brazil. There are several varieties, that yielding the official root being, according to Hanbury, the var. *granatensis* of Triana, distinguished mainly by its broader leaves. This is collected for export between Pamplona and the Magdalena in New Granada. *K. tomentosa*, St. Hil., seems to be only an extreme form of this variety, but it is considered distinct by A. W. Bennett (Fl. Brasil., l. c., 70), who would restrict *K. Ixina* to the plant of the Antilles; that species, however, was originally founded on the plant of Loefling from Venezuela.

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* *Ixina*, from the native name "Ixine" at Cumana, Venezuela, where Loefling discovered the plant in 1754.

Berg (l. c.) makes 24 species of *Krameria,* but some must be reduced to varieties. Rhatany roots are afforded by several others besides the two official ones; *e. g.* the Brazilian *K. argentea,* Mart. (figured in Fl. Bras., l. c., t. 28), the Texan *K. secundiflora,* DC., & the Chilian *K. cistoidea,* Hook.

DC. Prod., i, p. 341; Hanbury, in Pharm. Journ., 1865, p. 460; Berg, l. c., pp. 763-4; Grisebach, Fl. W. Ind. Islands, p. 31; A. W. Bennett, in Fl. Brasil. fasc. 63, p. 70.

Part Used and Names.—Ratanhia Granatensis; the dried root. It is not official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United States. But it appears to be fully equal in medicinal value, if not superior to the official or Peruvian Rhatany.

This kind of rhatany is commonly known under the name of Savanilla or New Granada Rhatany; but also as Antilles Rhatany; and from its colour, as Violet Rhatany. It is imported from New Granada.

General Characters and Composition.—Savanilla rhatany bears a considerable resemblance to Peruvian rhatany, but the pieces are not so long or so thick, being commonly only from about four to eight inches in length, and from one fifth to nearly half an inch in thickness. It is also well characterised by its dark purplish or violet colour, and its smooth and thick bark, which firmly adheres to the wood beneath, and which is marked with slight longitudinal furrows, and at varying intervals, by deep, narrow, transverse cracks. The bark is also less fibrous than that of Peruvian rhatany, and has therefore a more even fracture, and may be more readily reduced to powder. As a general rule the thickness of the bark of Savanilla rhatany varies from about $\frac{1}{4}$ to $\frac{1}{3}$ the diameter of the wood, while that of Peruvian rhatany rarely exceeds $\frac{1}{6}$ the diameter of the woody axis, and is frequently less. Hence, on an average, the proportionate thickness of the bark in Savanilla rhatany is twice that of Peruvian rhatany. This is an important and striking difference between the two roots, and as the active properties of rhatany essentially reside in the bark,

this is, in itself, strong evidence of the remedial value of Savanilla rhatany. This rhatany has a strong, purely astringent taste; but like that of Peruvian rhatany is without odour.

Savanilla rhatany owes its properties, like that of the Peruvian kind, to a form of *tannic acid*, but the tannin of the two is not identical, as is proved by the varying action of some reagents on the two roots.

Medical Properties and Uses.—Similar in every respect to those of the official or Peruvian Rhatany, for which it might be probably substituted with advantage.

Other Kinds of Rhatany.—Besides the two kinds of rhatany now described, the roots of several other species of *Krameria* have astringent properties, and have been employed for similar purposes.

One of these roots has within the last few years found its way to the Continent of Europe, but it is still unknown in the London market; this kind has been termed Brazilian, Para, or Ceara Rhatany, and also from its colour, Brown Rhatany. It is said to be derived from *Krameria argentea*, Martius, a native of the eastern provinces of the Brazils.

Para Rhatany has much resemblance to Savanilla Rhatany, but it has a darker colour, varying in this respect between dark grey and brown, hence its name of Brown Rhatany. The pieces of root are also longer, and are remarkable for their flexibility. The bark is thick and has numerous transverse cracks.

Flückiger has recently stated that the three kinds of rhatany now noticed by us may be distinguished by the different colours of their respective alcoholic extracts. Thus, if an alcoholic extract of the three kinds of rhatany be similarly prepared and diluted to an equal strength, the tincture of Peruvian rhatany becomes of a clear reddish colour; that of Savanilla rhatany appears yellowish, with a very faint tinge of green; and that of Para rhatany gives a perceptibly and purer yellow colour. He also adds, that if the very diluted tinctures of these three kinds of rhatany be mixed with solution of acetate of lead, the precipitate

from the Peruvian rhatany is of a red colour, whilst the precipitates formed in both the other tinctures are clear violet.

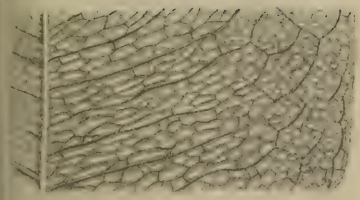
Per. Mat. Med., vol. ii, pt. 2, p. 570; Per. Mat. Med., by B. & R., p. 930; Pharmacographia, p. 76; U. S. Disp., by W. & B., p. 515; Pharm. Journ., vol. xvi, 1st ser., pp. 29 and 132; Hanbury, in Pharm. Journ., vol. vi, 2nd ser., p. 460; Flückiger, in Pharm. Journ., vol. i, 3rd ser., p. 84, and vol. vi, 3rd ser., p. 21.

DESCRIPTION OF PLATE.

Drawn from a Mexican specimen collected by Pavon in the British Museum.

1. A branch with flowers and fruit.
2. Front view of a flower.
3. Section of the same.
4. One of the anterior petals.
5. Fruit.
6. Section of the same.
7. One of the hooked spines.
8. Root.

(2–4 and 7 enlarged.)



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D Blair, ad nat. del. et lith.

M&N Hanhart imp.

MYROXYLON PEREIRÆ, *Klotzsch.*

N. Ord. LEGUMINOSÆ.

Tribe *Sophoreæ*.

Genus **Toluifera**,* *Linn.* (1742). B. & H., Gen., i, p. 558 (*Myroxylon*, Linn. f.); Baill., Hist. Pl., ii, p. 369; Klotzsch, in Bonplandia, 1857, pp. 272–277. Species 4 or 5 ? natives of tropical South America.

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83. Toluifera Pereiræ,† *Baill., Hist. Plant.*, ii, *p.* 383 (1870).

Syn.—Myrospermum Pereiræ, *Royle* (1853). Myroxylon Pereiræ, *Klotzsch.* Toluifera Balsamum, var., *Baill.*

Figures.—Pharmaceutical Journ., x (1850-51), pp. 280–282 (leaves and pods).

Description.—A tree attaining a height of about 50 feet, the trunk throwing out spreading ascending branches at 6 to 10 feet from the ground; bark of young branchlets purplish-grey, smooth, with white lenticels. Leaves alternate, without stipules, 6—8 inches long, pinnate with 6—10 alternate, shortly-stalked leaflets, readily disarticulating, rachis and thickish petioles (especially the latter) covered with a close felt of very short rufous hairs which is more dense on the buds and unexpanded leaves, leaflets 2—2¾ (usually about 2½) inches long by 1—1¼ wide, oblong-ovate, or sometimes slightly obovate, abruptly rounded at the base, with an attenuated, blunt, emarginate point often slightly twisted, entire but with the margin considerably puckered, slightly coriaceous, finely veined, midrib very prominent below; in the substance of the leaf between the smallest veins are more or less rounded or elongated glands or reservoirs which are transparent when the (dried) leaf is held against the light. Flowers numerous, on slender spreading pedicles ⅜ inch long, which readily separate from the axis above the very small bracts, laxly arranged in a long-stalked erect raceme 6 or 7 inches in length; rachis, bracts and pedicels all covered with a very short rufous tomentum; buds

* From affording Balsam of Tolu.

† Named in memory of Jonathan Pereira, M.D., F.R.S., the eminent author of 'Elements of Materia Medica,' and professor to the Pharmaceutical Society, who died in 1853.

ovoid, gibbous above. Calyx widely cup-shaped, shallow, with 5 very shallow, blunt teeth, rufous-tomentose outside, valvate. Petals 5, inserted perigynously near the base of the calyx, whitish, the posterior one (standard) with a long, linear-triangular, exserted claw, and an orbicular, veined, erect limb, the other four (wings and keel) similar, much smaller, linear-lanceolate, puckered, acute distant. Stamens 10, inserted in a ring with the petals, filaments slender, exserted, anthers nearly as long as filaments, equal, oblong, 2-celled, introrse, connective prolonged to form a short, sharp point. Ovary from the base of the calyx supported on a long stalk which carries it out beyond the calyx, short, smooth, compressed, with 1 or 2 ovules; style falcate, pointed. Fruit 3–4½ inches long, indehiscent, with a one-seeded cavity at its extremity, the stalk terete for about ½ inch, then laterally compressed and gradually widening to the seed-cavity, bordered on both edges, but chiefly on the ventral (upper) one, with a thick, chartaceous, stiff, flat wing, narrowest at the stalk end, and continued round the seed-cavity to the apiculus marking the position of the style on the ventral side, the whole outline of the legume somewhat falcate, pale brownish orange; pericarp rather loose and spongy, wrinkled externally, with two large reservoirs, filled with a liquid resin, in its substance, placed one on either side of the seed-cavity. Seed solitary, kidney-shaped, with a small radicle and large, convex, smooth cotyledons; no endosperm.

Habitat.—This Balsam-tree is found in woods on the Sonsonate coast or "Balsam Coast" of the state of San Salvador, Central America, formerly part of Guatemala; and in the neighbourhood of the small towns and villages in this country alone it is collected. A specimen labelled *M. Pereiræ* by the late D. Hanbury in the British Museum is from near Cordova, Mexico, collected by Finck in 1865, but has no fruit.

The identity of the genera *Toluifera*, L. (1742) and *Myroxylon*, Linn. f. (1781), was first we believe pointed out by Ruiz. The former name has undoubted priority, but has been generally set aside by authors, possibly on account of its adjectival form. We

cannot consider this as a sufficient reason for departing from the acknowledged rule in nomenclature, and have therefore employed the earlier name, as does also Prof. Baillon.

In Klotzsch's paper above quoted 8 species of *Myroxylon* are given, which it seems more correct to reduce to a considerably less number. Baillon, indeed, with much reason, now considers the present to be but a form of *T. Balsamum*, L. (*Myroxylon Toluifera*, H. B. K.), but we follow Hanbury in keeping them distinct, not having had the opportunity of examining good specimens of the latter.

The name "*Myrospermum Sonsonatense*, Pereira," used by Oersted and other writers for this plant, was never given by Pereira, who in his original account, referred to below, merely called the tree "*Myrospermum* of Sonsonate" for the purpose of distinction from other species.

Young plants of this tree may be seen in botanic gardens, but they have not flowered in this country.

Myroxylon peruiferum, Linn. f., long supposed to be the source of Balsam of Peru (as indicated by its name), is a distinct species. As there has been so much confusion in the nomenclature of plants of this genus it will be desirable to give some references to figures and descriptions. It has many synonyms and has been figured several times:—*Syn.*—Myrospermum peruiferum, *DC.*; M. pedicellatum, *Lam.*; M. erythroxylon, *Allemao*; Myroxylum pubescens, *H. B. K.* ?; Myroxylon pedicellatum, *Klotzsch.* M. robiniæfolium, *Klotzsch* ? *Figures.*—Nees t. 321 (poor); Lambert, Ill. Gen. Cinchona t. i, figs. 1 and 2, cop. in Steph. and Ch. t. 102 (flowers only); Hayne. xiv, t. 11; Berg and Sch., t. 29 e. This tree is a native of Ecuador, Peru, and Brazil, and yields a fragrant balsam not unlike Balsam of Tolu, called at Rio "Olea vermelho."

Pereira, in Pharm. Journ., x, pp. 230, 280; Royle, Materia Medica, ed. 2, p. 414; Klotzsch, in Bonplandia, 1857, p. 274; Hanbury, in Pharm. Journ., 1864, pp. 241, 315; Baillon, in Pharm. Journ., Nov., 1873, p. 382; Flück. & Hanb., Pharmacogr., p. 180; Bentham, in Fl. Brasil, fasc. 34, p. 310.

Official Part and Name.—Balsamum Peruvianum; a balsam obtained from Myroxylon Pereiræ, *Klotzsch* (B. P.). An oleo-resin (*Balsamum Peruvianum*), which exudes from the trunk of the tree after the removal of the bark, which has been previously scorched by fire (I. P.). Balsamum Peruvianum; an empyreumatic liquid balsam obtained from Myrospermum Peruiferum, *De Candolle* (U. S. P.).

Extraction and Commerce.—From information communicated by the late Dr. Charles Dorat, of Sonsonate, Salvador, to Professor Carson of the United States, and the late Daniel Hanbury, and published in the *American Journal of Pharmacy* and the *Pharmaceutical Journal*, it appears that Balsam of Peru is now obtained as follows:—Early in November or December, or after the last rains, the stems of the balsam trees are beaten on four sides with the back of an axe, a hammer, or other blunt instrument, until the bark is loosened; the four intermediate strips being left untouched in order not to destroy the life of the tree. The bruised bark soon cracks in long strips, and may be easily pulled off, when it is found to be sticky as well as the surface of the wood below it from a slight exudation of fragrant resin, but the quantity which thus flows is not worth collecting. In order, therefore, to promote an abundant flow, it is customary, five or six days after the bark has been beaten, to apply lighted torches or bundles of burning wood to the injured bark, which thus becomes charred; and after about eight days, the pieces of charred bark either fall off or are removed, and the stem commences to exude the balsam. This is collected by placing rags so as entirely to cover the bare wood, and as these become saturated with the balsam, which is of a light yellowish colour, they are collected and thrown into an earthenware boiler, three-quarters filled with water, and stirred and boiled gently until they appear nearly clean, and the now dark and heavy balsam sinks to the bottom. This process goes on for some hours, the exhausted rags being from time to time taken out and fresh ones thrown in; and after they are removed they are submitted to pressure by which much balsam is still obtained. The press consists of a small open bag about fourteen

inches long, made of stout pieces of rope fixed together with twine, open at the middle and looped at both ends to receive two sticks. The rags are placed inside the bag and the whole is twisted round by means of the sticks, and the balsam thus squeezed out. A washerwoman wringing out a wet cloth fairly represents the process. The balsam thus procured is added to that in the boiler. When the boiler has cooled the water is decanted, and the balsam is poured into *tecomates* or gourds of different sizes, and sent to the market. Sometimes, in order to purify the balsam, it is left for several days in the boiler, when the impurities float to the surface, and are skimmed off.

The second year the balsam is obtained from the same trees by bruising the bark, &c., that was left untouched in the previous year; and as the bark is renewed in two years, the same tree will yield an annual supply of balsam for very many years, provided a rest of five or six years be allowed at intervals of about twenty years.

Balsam of Peru is principally exported by way of Acajutla on the Pacific Coast; but also, to some extent, by Belize and other ports on the Atlantic side of Central America, whither it is brought across the country. Balsam of Peru is exclusively the produce of the state of Salvador in Central America. The balsam was originally supposed to be the produce of Peru, hence its name; an error which arose from its originally coming to Europe indirectly by way of Peru. The quantity of balsam now exported is uncertain, but some years since the annual produce was computed at about 25,000 pounds. Balsam of Peru was formerly exported in large earthenware jars, which were wrapped in straw, and sewed up in raw hide; but it is now usually imported in tin canisters or drums, which are much less liable to breakage.

General Characters and Composition.—Balsam of Peru is a viscid liquid, about the consistence of treacle, and of a nearly black colour when seen in bulk, but when examined in thin films, it is transparent, and of a deep orange or reddish-brown colour. It has an agreeable balsamic odour, which is more

especially observable when it is thinly spread on paper and warmed; its taste is warm and bitterish, and after being swallowed it leaves a disagreeable burning or pricking sensation in the throat. It is inflammable, and as it burns it gives off a whitish smoke and agreeable odour. Its specific gravity varies from 1·15 to 1·16. It is soluble in chloroform, and in about five parts of rectified spirit; but when mixed with water it undergoes no diminution of volume, although it yields to it traces of cinnamic and benzoic acids.

Balsam of Peru is composed of about 38 per cent. of a black, brittle, amorphous *resin*, which is odourless and tasteless, and which is soluble in caustic alkalies, and also in alcohol, and which by destructive distillation furnishes benzoic acid, styrol, and toluol; and of about 60 per cent. of *Cinnamein* or *Benzylic Cinnamate*, a brownish aromatic liquid,resolvable by the concentrated caustic alkalies into cinnamic acid and benzylic alcohol. It is probably owing to some alteration produced in the benzylic cinnamate by the process followed in obtaining the balsam, that its dark colour and the free acids which the balsam always contains are due.

Some naturally exuded resin of the balsam tree examined by Attfield, was found to contain 77·4 per cent. of resin which was without any aromatic properties, and contained no cinnamic acid; hence he concluded that it was quite distinct from Balsam of Peru, the one having no apparent relation to the other.

Medical Properties and Uses.—Balsam of Peru possesses stimulant and expectorant properties, and has been administered with success in chronic bronchitis, rheumatism, and asthma. It acts more especially on the mucous membranes, and hence it may be also employed to check excessive discharges, as in leucorrhœa, gleet, &c. It is also used as a stimulant application to indolent ulcers, bedsores, sore nipples, &c., and also in offensive discharges from the ear, &c. It is but little used, however, as a medicine either in this country or in the United States of America.

Balsam of Peru is sometimes employed in the manufacture of soap to which it imparts its fragrance, and also causes the soap to

wash with a soft creamy lather. Such soap is also regarded as useful in winter for chapped hands.

Other Products of the Balsam of Peru Tree.—Besides the true Balsam of Peru as now described, another balsamic substance is obtained in Salvador, by pressure without heat, from the fruit of the Balsam of Peru tree, after the removal from it of the fibrous portions of the epicarp and mesocarp. It is called *Balsamo blanco* (White Balsam) ; this has been sometimes confounded with Balsam of Tolu, from which, however, it is readily distinguishable. When first obtained this balsam is a yellow, semi-fluid, and somewhat granular substance ; which on standing separates into a whitish, opaque, crystalline, resinous deposit, and a superior translucent more fluid portion. Its odour is not particularly agreeable, but has been compared to melilot. White Balsam when examined by Stenhouse, yielded a neutral crystalline resin which he termed *Myroxocarpin ;* this occurs in the form of thin, colourless, tasteless prisms, an inch or more in length, insoluble in water, but soluble in hot alcohol or ether. White Balsam is scarce and valuable, and is not found in commerce.

Another product called *Balsamito* is obtained by digesting the fruit of the Balsam of Peru tree in rum. It is a clear liquid, having the colour of sherry, an odour resembling the tonquin bean, and a bitterish taste. It is regarded as stimulant, diuretic, and anthelmintic ; and is much used internally in colic, hysteria, &c. ; and as an external application to gangrenous or indolent ulcers, and as a wash to remove freckles from the face. It is not an article of commerce.

Per. Mat. Med., vol. ii, pt. 2, p. 307 ; Per. Mat. Med., by B. & R., p. 827 ; Pharmacographia, p. 181 ; U. S. Disp., by W. and B., p. 163 ; Piesse's Art of Perfumery, 3rd edit., p. 123 ; Amer. Journ. of Pharm., vol. xxxii, p. 303 ; Hanbury, in Pharm. Journ., vol. v, 2nd ser., pp. 241 and 315 ; Attfield, in Pharm. Journ., vol. v, 2nd ser., p. 248 ; Stenhouse, in Pharm. Journ., vol. x, 1st ser., p. 286.

DESCRIPTION OF PLATE.

Drawn from a specimen collected by Dr. Dorat at Izalco, San Salvador, in 1863, in the herbarium of the late D. Hanbury; the fruit added from specimens sent to Pereira from the Balsam Coast by M. Klee, in the British Museum.

1. A flowering twig with leaves.
2. Part of leaf seen by transmitted light.
3. Vertical section of a flower.
4. Legumes; one opened to show the seed.
5. Transverse section of the same, showing the resiniferous cysts.
6. A seed.

(2 and 3 enlarged.)

D.Blair, ad.nat.del.et lith.

M&N.Hanhart imp

TAMARINDUS INDICA, *Linn.*

N. Ord. LEGUMINOSÆ *Cæsalpineæ*.

Tribe *Amherstieæ*.

Genus Tamarindus,* *Linn.* B. & H., Gen., i, p. 581; Baill., Hist. Pl., ii, p. 182. The only species is the following.

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92. Tamarindus indica, *Linn., Sp. Plant, ed.* 1, *p.* 34 (1753).

Tamarind. Tintiree (Bengal).

Syn.—T. occidentalis, *Gaertn.* T. officinalis, *Hook.*

Figures.—Woodville, t. 161; Hayne, x, t. 41; Steph. & Ch., t. 88; Nees, t. 343; Berg & Sch., t. 9 c; Bot. Mag., t. 4563; Baill., l. c., figs. 73–76; Beddome, Fl. Sylvat., t. 184.

Description.—A large tree, attaining 60 to 80 feet in height, and bearing a very large, widely-spreading head of foliage, trunk with a dark rough bark, youngest twigs smooth or slightly pubescent. Leaves alternate, with small, linear, very caducous stipules, abruptly pinnate, 3 or 4 inches long; leaflets in about 8—16 pairs, opposite, ½—1 inch long, sessile, articulated, set on obliquely and overlapping, oblong, usually very blunt, unequal at the base, entire, rather thick, veined beneath. Flowers rather small, stalked, readily disarticulating, arranged in lax, few-flowered racemes which are axillary or terminal on short lateral branches generally shorter than the leaves. Calyx narrowly funnel-shaped below, divided above into 4 ovate-lanceolate, acute, entire, spreading segments, imbricate in the bud, and then reddish-purple, the upper one the largest (made up of two combined). Petals 3, 1 posterior, 2 lateral, oblong or oval, the posterior one narrowest, about as long as the calyx segments, perigynous, somewhat crisped at the margin, white or pale yellow with red veins; two minute subulate bodies in front of the stamens may represent abortive anterior petals. Stamens with the filaments connate below to form a sheath, open above, and inserted perigynously on the anterior (inferior) part of the mouth of the calyx-tube, only 3

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* *Tamarindus*, a mediæval Latinization of the Arabic name for the fruit, meaning Indian Date.

perfect, on rather long free filaments alternating with other rudimentary ones at the summit of the sheath; anthers oblong, dehiscing longitudinally. Ovary on a stalk coming from the posterior (superior) part of the calyx-tube, curved upwards, 1-celled, with numerous ovules; style long, hooked. Fruit pendulous, pod-shaped, slightly compressed, scarcely an inch wide, varying in length from 3 to 6 inches, usually somewhat curved, nearly smooth, pale chocolate brown, pericarp (epicarp) rather thin, indehiscent, easily broken, filled with a firm soft pulp surrounding the seed-cavities; on the outer surface of the pulp run three tough, woody, branching fibrous cords, from the base towards the apex. Seeds 2 to 8 (according to the length of the fruit), each lodged in a cavity in the pulp lined with a tough membrane (endocarp ?), somewhat quadrangular with rounded angles, flattened, with the centre of each flat side marked with a large central depression, smooth, purplish-brown, somewhat polished; embryo with large thick cotyledons, which include the small radicle; no endosperm.

Habitat.—This beautiful and useful forest-tree is now found in all tropical countries, but Africa appears to have the greatest claims to be considered its original home. On that continent it is common in the districts of the Upper Nile, in Nubia and Abyssinia, the central districts wherever explored, and the more southern countries on both east and west coasts, Senegal and Zambesi-land. The tamarind grows also throughout the Indian Peninsula and in the Philippines and Java, and has been collected in tropical Australia and the Pacific Islands. In the New World it has doubtless been introduced, but is now abundant in Jamaica and other W. Indian Islands, Brazil, Central America, &c. It is extensively planted in warm countries, not only for its fruit, but for the scent of its blossoms, and as a shade-tree. Small specimens may be seen in our stoves (where they flower but do not produce fruit).

Roxburgh, Fl. Ind., iii, p. 215; Benth., Fl. Austral., ii, p. 294; Oliver, Fl. Trop. Africa, ii, p. 308; Lindl., Fl. Med., p. 266.

Official Part and Names.—TAMARINDUS; the preserved pulp of the fruit, imported from the West Indies (B. P.). The pulp of

the fruit (*Tamarindi Pulpa*) (I. P.). TAMARINDUS; the preserved fruit (U. S. P.).

Preservation of Tamarinds.—Before being exported, tamarinds always undergo some preparation, which varies, however, in different countries. Thus, the usual mode of preserving them in the West Indies is, to remove the shell or epicarp from the ripe fruit, and to place alternate layers of the shelled fruit and powdered sugar in a cask or jar, and then to pour boiling syrup over them till the cask or jar is full; or they are simply placed in layers in a cask, and boiling syrup poured over them. In the East Indies, it is the usual practice to prepare the fruits by simply removing their outer shell, and pressing the remaining portions together into a mass. The pulp of West Indian Tamarinds is alone official in the British Pharmacopœia, and in the Pharmacopœia of the United States; but on the Continent of Europe, the pulp of East Indian Tamarinds is only employed for medicinal purposes.

Kinds of Tamarinds.—In commerce the two kinds of tamarinds as thus preserved, the former with sugar, the latter without, are distinguished as West Indian and East Indian Tamarinds, the characters of which are as follows:

1. *West Indian Tamarinds.*—These, which are also called *Brown or Red Tamarinds,* are found in the form of a reddish-brown, moist, sugary mass, enclosing strong fibres, and brown shining seeds, each of which is enclosed in a membranous coat; they have a very agreeable, refreshing, sub-acid taste. This kind of tamarinds is said to be sometimes prepared in copper vessels, and to be therefore liable to contamination with that metal, to detect which a piece of bright iron should be left in contact with the pulp for an hour, when copper, if present, will be deposited on it. West Indian Tamarinds is the kind usually found in the shops in this country and the United States, and is, as already stated, the only official kind.

2. *East Indian Tamarinds.*—These are also termed *Black Tamarinds,* and are found in the form of a firm, clammy, brown or black mass, consisting of the pulp and seeds, mixed with strong fibres and some remains of the shell. They have a very acid taste.

Besides the two kinds of commercial tamarinds as above described, there is a third kind of tamarinds sometimes to be found in the south of Europe, and known as *Egyptian Tamarinds*. This kind is in the form of flattened rounded cakes, 1 or 2 inches thick and from 4 to 8 inches in diameter, of a firm consistence, and black colour. The cakes are prepared by kneading together the softer part of tamarinds; and are much used in Egypt and some other parts of Africa.

The principal constituents of unpreserved tamarind pulp are *sugar* and *pectin* with *citric, acetic,* and *tartaric acids,* either in a free state or combined with potash, the latter more especially in the form of the bitartrate. There is no known constituent in tamarinds to account for their laxative properties.

Medical Properties and Uses.—Tamarinds have slightly laxative properties, and are also refrigerant from the acids they contain. An infusion of tamarind pulp forms a very grateful and useful drink in febrile affections. Tamarind whey, which may be prepared by boiling about two ounces of the pulp with two pints of milk, may be similarly used. Tamarind pulp is occasionally prescribed in combination with other mild cathartics, as in the confection of senna. It is also sometimes useful, and forms a pleasant addition to the diet of convalescents, to maintain a slight action on the bowels.

In very hot countries, as in the interior of Africa, tamarinds are highly valued for the preparation of refreshing beverages.

The seeds contain tannic acid, and are therefore used in India as an astringent in bowel affections; and when deprived of their testa by long boiling, the soft kernels which are left, are eaten by the natives of India as food, in times of scarcity.

Per. Mat. Med., vol. ii, pt. 2, p. 348; Pharmacographia, p. 198; U. S. Disp., by W. & B., p. 856; Pharmacopœia of India, p. 445.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Royal Botanic Society's Garden, Regent's Park, in flower in July; the fruit added. 1. A flowering branch. 2. Vertical section of flower. 3. The androecium. 4. A fruit. 5. Vertical section of part of the same. 6. Seed. 7 and 8. Sections of the same. (2, 3 enlarged.)

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D Blair ad nat del et lith.

M & N Hanhart imp

VALERIANA OFFICINALIS, *Linn.*

N. Ord. VALERIANACEÆ. Lindl., Veg. K., p. 697; Le Maout and Dec., p. 488.

Genus Valeriana,* *Linn.* B. & H., Gen., ii, p. 155. Species 150, natives of temperate climates in both old and new worlds, principally of the northern hemisphere.

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146. Valeriana officinalis, *Linn., Sp. Plant., ed.* 1, *p.* 31 (1753).

Common Valerian. All-heal.

Syn.—V. sambucifolia, *Mikan.* V. angustifolia, *Tausch.*

Figures.—Woodville, t. 32; Hayne, iii, t. 32; Steph. & Ch., t. 54; Nees, t. 254; Berg & Sch., t. 28 d; Curt., Fl. Londin., fasc. 6; Syme, E. Bot., iv, t. 666; Reichenb., Ic. Fl. Germ., xii, tt. 726, 727 Nees, Genera Fl. Germ.

Description.—A perennial herb with a very short upright root-stock giving off numerous, slender, rather fleshy, cylindrical, tapering, pale-brown roots, 3 or 4 inches long, and also often sending out short runners or suckers, at the ends of which young plants are developed. Stem solitary, erect, 2—3 feet high, branched only at the top, cylindrical, hollow, fluted and channelled, smooth, often a little hairy at the base and just beneath the nodes. Leaves few, opposite, pinnate, the lower ones (soon withering) with long petioles dilated and stem-clasping below, leaflets sessile, opposite or alternate, 8—20 with a terminal one, ¾—2½ inches long, varying from oval to linear-lanceolate, acute, entire or serrate on the inner or on both margins, smooth, thin, shining, the upper leaves sessile, very much smaller, scarcely compound and passing into bracts above. Flowers small, numerous and crowded, sessile, arranged in threes at the extremities of the ultimate divisions of the trichotomous, compound, divaricate cymes which terminate the stem and branches, the whole forming a large more or less flat-topped cyme; bracts numerous, entire, linear-acuminate, membranous.

* *Valeriana*, a name first met with in use by the pharmacists and physicians of the 9th or 10th centuries; of uncertain meaning and origin, but probably from *valeo*, to be powerful, from its effects as a drug.

Calyx-tube combined with the ovary, the limb small and ring-like, lobed, the lobes curled inwards. Corolla about $\frac{1}{6}$ inch wide, pale pink, with a narrowly funnel-shaped tube, gibbous at the base below, and 5 nearly equal, spreading, broadly oblong, rounded lobes, the odd one inferior, the tube hairy within. Stamens 3, inserted about half way down the tube of the corolla and alternating with its lobes (the posterior and one of the anterior ones being suppressed), much exserted, anthers small, two-celled, yellow. Ovary inferior laterally compressed, smooth, one-celled (2 suppressed) with a single pendulous anatropous ovule, style a little longer than the corolla-tube, stigma 3-fid. Fruit scarcely $\frac{1}{6}$ inch long, ovate-oblong in form, plane-convex, compressed, with 3 prominent ribs on the convex, and 1 on the plane side, pale brown, smooth, indehiscent, crowned with the persistent calyx-lobes which have developed into elegant curved feathery plumes (pappus). Seed solitary, filling the fruit-cavity, straight, with large flat obovate cotyledons; no endosperm.

Habitat.—Valerian is a common plant in all parts of this country, growing in damp ground, both in woods and open places. It has a very extensive distribution from Iceland, Arctic Europe and Asia to the Mediterranean, Crimea, West Asia and Japan, and several forms are distinguished. The plant with fewer and wider leaflets (*V. sambucifolia*, Mikan) is by far the most common in England, and is partial to more wet places than the form figured, var. *Mikanii*, Syme, which is found more rarely, in upland pastures, especially chalky banks and similar places.

Valerian is cultivated for use near Chesterfield in Derbyshire, also in Holland, and near New York, and some other parts of the United States.

Syme, E. Bot., iv, p. 236; Hook. f., Stud. Fl., p. 181; Watson, Comp. Cyb. Brit., p. 205; Gren. & Godr., Fl. France, ii, p. 54; Ledebour, Fl. Ross, ii, p. 438; Franchet & Savatier, Enum. Plant. Japon., i, p. 217.

Official Part and Names.—VALERIANÆ RADIX; the dried root, from plants indigenous to, and also cultivated in, Britain; col-

lected in autumn, that from wild plants growing on dry soil to be preferred (B. P.). The root (*Valerianæ Radix*) (I. P.). VALERIANA; the root (U. S. P.).

Collection.—In England valerian is chiefly collected in the autumn from cultivated plants; but some is also obtained from wild plants. When cultivated, the tops are cut off in the spring so as to prevent the plants from flowering and seeding, which materially injures their activity; and at Michaelmas, the rhizomes or roots are dug up carefully and washed; the remaining tops are then cut close off, and the thickest part of the rhizomes slit down to facilitate their drying, which is effected in a kiln; they are then packed tight, and kept very dry, to prevent their spoiling.

General Characters and Composition.—The so-called valerian root consists of a very short, upright, tuberculated rhizome, about the thickness of the little finger, from which arise numerous slender tapering rootlets, three or four inches long. These rootlets have a shrivelled appearance, are very brittle, and like the rhizome, have a dark yellowish-brown colour externally, and are whitish within.

Valerian root has a camphoraceous, slightly bitter, unpleasant taste; and a strong, peculiar, somewhat camphoraceous and terebinthinate odour, which to most persons is very disagreeable. This very characteristic odour is acquired by valerian root as it dries, for when in a fresh state, the odour is scarcely noticeable. The cultivated valerian root is less active than the uncultivated or wild sort, although from being the finer-looking it is commonly preferred by pharmacists.

When distilled with water valerian root yields a *volatile oil* and *valerianic acid*, to which substances, more especially the former, it owes its activity. The volatile oil is contained in the dry commercial root in varying proportions of from ½ to 2 per cent., the root collected from plants found in a dry stony soil yielding more oil than when derived from those growing in a wet fertile one. When the oil is first distilled it has but very little odour, but by exposure to the air it acquires the strong characteristic odour of valerian root. Oil of

valerian as obtained from the dried root is a mixture of about 5 per cent. of *valerianic acid*, 25 per cent. of *valerene* or *borneene*, which very much resembles oil of turpentine, and the remainder consists of various oxygenated compounds. A difference of opinion exists amongst chemists as to whether the volatile oil exists ready formed in the living root, or whether it is produced by a reaction similar to that which takes place in the production of the volatile oil of bitter almonds. It is certain, however, that valerianic acid and the various resinoid products contained in the oil are the results of oxidation.

Medical Properties and Uses.—Valerian is a stimulant, antispasmodic, and nervine tonic, but as an antispasmodic it is much inferior to assafœtida. In excessive doses it causes headache, mental excitement, and various other effects indicating derangements of the nervous system. Large doses also frequently cause nausea. It has been used with much advantage in hysteria and in hysterical affections generally. It has also been much employed in epilepsy, chorea, and hypochondriasis, but with very varying results. In some cases it has been found useful when combined with cinchona bark or other tonics, in intermittents. Baths of valerian have also been found of value in acute rheumatism. In Germany, and some other parts of the continent, it is esteemed as a stimulant in the low forms of fever, but in this country it has been but little employed in such cases. As the virtues of valerian essentially reside in the volatile oil, this is a good form of administration. Valerianic acid has also been occasionally prescribed, but with no very definite results; indeed, Dr. John Harley says that in doses of "two drachms or more, it appears to have the same action as so much acetic acid, causing gastric irritation, nausea, and colicky pains, followed by slight exhilaration." But some of its salts, more especially that of valerianate of zinc, have been certainly administered with advantage in hysteria, chorea, epilepsy, &c.

Per. Mat. Med., by B. & R., p. 698; Pharmacographia, p. 337; U. S. Disp., by W. & B, pp. 881 and 981; Garr., Mat. Med.,

p. 288; Royle's Mat. Med., by J. Harley, p. 544; Amer. Journ. Pharm., May, 1861, p. 239, and Jan., 1867, p. 70; Wittstein's Vierteljahresschrift f. prakt. Pharm., vol. xviii (1869), p. 73; Bouchardat, Manuel de Matière Médicale, vol. i (1865), p. 290.

DESCRIPTION OF PLATE.

Drawn from a specimen collected at Cherry Hinton, near Cambridge.

1. Upper part of stem with inflorescence.
2. Lower portion of stem with roots.
3. A flower.
4. Vertical section of the same.

5 and 6. Fruit.

7. Transverse, and—8 and 9. Vertical section of the same.

(3, 4, 6-9 enlarged.)

Blair ad nat. del.et lith

M & N Hanhart imp

HYOSCYAMUS NIGER *Linn.*

N. Ord. SOLANACEÆ.

Tribe *Hyoscyameæ*.

Genus **Hyoscyamus**,* *Linn.* B. & H., Gen., ii, p. 903. Species about 10, natives of the warmer extratropical regions of Europe, Asia, and Africa.

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194. Hyoscyamus niger, *Linn., Sp. Plant., ed.* 1, *p.* 179 (1753).

Henbane.

Syn.—H. agrestis, *Kit.* H. pallidus, *Kit.*

Figures.—Woodville, t. 76; Hayne, i, t. 28; Bigelow, i, t. 17; Steph. and Ch., t. 9; Berg & Sch., t. 16 f; Syme, E., Bot., vi, t. 936; Nees, Gen. Fl. Germ.

Description.—An annual or biennial herb, 1—2½ feet high, with a large tap-shaped wrinkled root, brown outside and white within, and an erect, branched, thick, stiff, cylindrical, pale green stem, covered with long, clammy, jointed, glandular hairs. Root-leaves large, 6—8 inches long or more, stalked, spreading in a rosette, triangular-ovate with an undulated sinuate margin, stem-leaves much smaller, passing into bracts, alternate, sessile and somewhat amplexicaul, ovate-oblong, acute, with large undulated, spreading laciniæ; all thin, pale green, flaccid, slightly hairy above, more conspicuously below, and the veins covered also with long, viscid-glandular hairs. Flowers numerous, sessile or shortly stalked, solitary in the axils of the large, leafy, spreading bracts, crowded, the whole forming a two-ranked, unilateral, scorpioid spike or raceme, which elongates and straightens out after flowering. Calyx large, bell-shaped, with an ovoid tube and a broadly-funnel-shaped, spreading limb, with 5 shallow, equal, broadly-triangular acute teeth, covered with long, clammy hairs, persistent. Corolla 1—1¼ inch wide, the tube funnel-shaped, the limb spreading, and divided into 5 rounded, blunt, shallow, rather unequal lobes, imbricated in the bud, straw-coloured elegantly net-veined with purple and with a purple throat. Stamens 5, inserted near

* *Hyoscyamus*, in Greek ὑοσκύαμος, literally hog-bean, the classical name.

the base of the corolla-tube, but adherent to it for half way up and there slightly hairy, filaments slender, shorter than the corolla but somewhat exserted, anthers dorsifixed, purple, dehiscing longitudinally. Ovary about as long as, and inclosed in the tube of the calyx, smooth, 2-celled, with a thin partition and large axile placentas; style a little exceeding the stamens. Fruit a capsule, enclosed in the globular tube of the enlarged persistent calyx, now an inch long, tough, coriaceous, and with prominent, stiff veins; pericarp smooth, gibbous at the base, the portion in contact with the calyx-tube membranous and semi-transparent, the top hard and rigid, forming a cap or lid, along the lower edge of which dehiscence takes place, 2-celled. Seeds very numerous, closely packed on the large, spongy placentas, roundish-oval in outline, about $\frac{1}{18}$ inch wide, hollowed slightly on each side, brown, marked with fine but conspicuous, prominent reticulations; embryo much curved in the endosperm.

Habitat.—A native of this country, and not uncommon in sandy ground, the borders of commons, waste places, and the sea-coast; in some parts abundant; scarcely native in Scotland. It is found throughout Europe except the extreme north, and is very common in the Mediterranean regions and Western Asia, extending to India and Siberia. In America it is an old introduction. For medicinal purposes it is cultivated in Surrey, Herts, Bedfordshire, and Cambridgeshire; the biennial plant which produces merely a large tuft of spreading radical leaves in the autumn of the first year, being preferred. A variety without the purple veins in the corolla, which is thus entirely of a pale yellow colour, has been named *H. pallidus*, Kit. *H. agrestis*, Kit, is the small, annual form.

Dunal, l. c., p. 546; Syme, E., Bot., vi, 106; Hook. f., Stud. Fl., p. 255; Wats., Comp. Cyb. Br., p. 251; Gren. & Godr., Fl. France, ii, 546; Ledebour, Fl. Ross, iii, p. 192; Lindl., Fl. Med., p. 508.

Official Parts and Names.—Hyoscyami Folia; the fresh leaves with the branches to which they are attached; also the leaves separated from the branches and carefully dried; gathered from

wild or cultivated British biennial plants when about two thirds of the flowers are expanded (B. P.). The dried leaves (*Hyoscyami Folia*), collected when about two thirds of the flowers are expanded (I. P.). 1. Hyoscyami Folia; the leaves: 2. Hyoscyami Semen; the seed (U. S. P.).

1. Hyoscyami Folia. *Hyoscyamus Leaves. Henbane Leaves.*—*Collection.* The advantage of collecting the leaves of plants after the partial expansion of their flowers has been already noticed under the head of *Digitalis purpurea.* But the reason why the young branches should be gathered with the leaves, as also directed in the British Pharmacopœia, has still to be explained. It has been described by one of us in the *Pharmaceutical Journal,* as follows:—Thus after showing the action of the leaves in the formation of the products and secretions of plants, it is stated "that without leaves or other organs of an analogous nature, no growth to any extent can take place, or any secretions be formed in the plant. Thus the floral leaves and the green parts of the flower have a similar effect to the leaves; even the young herbaceous parts, from which the leaves and other organs arise, are also directly concerned in the formation of products and secretions. This assimilating power of the young green herbaceous parts is commonly lost sight of, but in reality the structure of these parts is essentially the same as the leaves, except that their tissues are somewhat more compact and differently arranged; hence, in proportion to amount of matter, they do not expose so large a surface to the action of air and light as the leaves, and as the process of assimilation only takes place in the cells immediately below the epidermis, their powers of forming products and secretions are somewhat less intense; but the difference between the parts immediately in contact with the leaves and the leaves themselves must be very slight. Indeed, it is by no means certain but that the young herbaceous parts frequently contain quite as much, or even more, active secretions than the leaves themselves; thus, if the latter organs be left on the stem till they have passed their active vital condition, the active secretions which they normally contain, will have passed to a great degree into the

young branches, and hence they would then be probably more active than the leaves, as they would in such cases be not only assimilating organs, but also the receptacles for the products and secretions formed in the surrounding parts. Hence, in practice, in making preparations from herbaceous plants, we may consider the young vitally active parts in immediate contact with the leaves, as not materially differing in activity from them, and that consequently they may be advantageously as well as economically used with them." Although the above description is necessarily somewhat long, we have given it in full, because it is not only applicable in the collection of Hyoscyamus leaves, but also to those of several other plants noticed in this work.

One hundred pounds of the fresh herb yield about fourteen pounds when dried. The leaves of the biennial variety of henbane gathered in the second year, at the time directed in the British Pharmacopœia, are regarded as the most active, and are alone official in this country. But experiments upon the relative merits of the annual and biennial varieties of Henbane are still a desideratum.

General Characters.—The characters of the second year's leaves, &c., are given in the British Pharmacopœia as follows :— "Leaves sinuated, clammy, and hairy. The fresh herb has a strong unpleasant odour, and a slightly acrid taste, which nearly disappear on drying. The fresh juice dropped into the eye dilates the pupil." In a dried state, henbane is sold in three conditions. 1. The foliage and green tops of the Annual plant ; 2. the leaves of the first year's Biennial plant ; and 3. the foliage and green tops of the Biennial plant.

2. Hyoscyami Semen. *Hyoscyamus Seed. Henbane Seed.*— Henbane seeds are official as well as the leaves in the United States Pharmacopœia, but the latter are nevertheless alone ordered in the preparations of that volume. Everywhere the leaves are more commonly employed, and are most esteemed. Hyoscyamus seeds are small, somewhat compressed, roundish, finely reticulated, of a brownish colour, an oleaginous bitter taste, and with the same odour as the plant.

3. Substitutes.—In the south of Europe, *Hyoscyamus albus*, a native of the region of the Mediterranean, and so-called from the pale colour of its flowers, is used as the official henbane, and is regarded as equal to it in medicinal value. Stocks has also described a very virulent species of *Hyoscyamus* under the name of *H. insanus*, a common plant of Beluchistan, and called Mountain Hemp, and which, he states, is sometimes used for smoking, and also for criminal purposes; it would be desirable to have further particulars of this plant.

Composition of Hyoscyamus Leaves and Seeds.—The most important constituent of hyoscyamus is *hyoscyamia* or *hyoscyamine*, an alkaloid which has been obtained both from the leaves and seeds, but it exists in the largest proportion in the latter, but even these only yield of it, according to Höhn and Reichardt, about 0·05 per cent. The leaves, as first shown by Attfield, also contain nitrate of potassium; and according to Thorey, this salt, and the alkaloid hyoscyamia, are largest in amount before the process of flowering.

Medical Properties and Uses.—Dr. John Harley, who has made observations on the action of hyoscyamus, says, "Henbane, like belladonna, produces dilatation of the pupil, somnolency, a parched condition of the tongue and mouth, and in sufficient doses delirium. The general action of henbane on the secretions and nervous system agree in all respects with that of belladonna, and the result of its action is the same, but the influence of henbane on the cerebrum and motor centres is somewhat greater, while its stimulant action on the sympathetic is less. Both drugs directly stimulate the heart, but after moderate doses the action of henbane results in a sedative effect. Small doses of henbane are sedative and tonic to the heart; large doses excite it, and excessive doses depress it almost as readily as those of belladonna. Both drugs produce relaxation of the voluntary muscles and of the occluding fibres of the intestine and bladder." Hence, he regards henbane as a valuable remedy in cardiac and pulmonary asthma; in excited cardiac action from valvular disease; as an anodyne in renal colic, and numerous other affections; as a

useful remedy in spasmodic affections of the uterus, bladder, urethra, &c.; and in hypochondriasis and emotional epilepsy, &c. The use of henbane is contra-indicated in convulsive and cerebral diseases generally; and old and feeble persons are frequently unpleasantly affected by henbane. It may be frequently given as a substitute for opium, where the administration of the latter is objectionable, as it does not cause constipation and sickness like it. In India henbane seeds are prescribed by the Mahomedan doctors "to soothe the mind, procure sleep, and keep the bowels gently open in cases of melancholia and mania." Garrod has demonstrated that hyoscyamus should not be given in combination with free potash or soda, which render it perfectly inert; but according to Dr. John Harley, the action of these substances on henbane is so slow that a dose of henbane is not impaired by taking it with one of a caustic alkali. Locally applied, henbane may prove valuable in certain diseases of the eye from the power it possesses of dilating the pupil; and as an external application it may be employed in various neuralgic and other painful and irritable affections.

Per. Mat. Med., vol. ii, pt. 1, p. 539; Pharmacographia, p. 416; U. S. Disp., by W. & B., p. 471; Royle's Mat. Med., by J. Harley, p. 485; Garr., Mat. Med., p. 329; Pharmacopœia of India, p. 180; Pharm. Journ., vol. i, 1st ser., p. 406; Lancet, May 8th, 1841; Bentley, in Pharm. Jour., 2nd ser., vol. 3, p. 475; Usher, in Pharm. Journ., 2nd ser., vol. ix, p. 85; Tilden, in Pharm. Journ., 2nd ser., vol. viii, p. 127; Attfield, in Pharm. Journ., vol. iii, 2nd ser., p. 447; Stocks, in Hooker's Journ. Bot., vol. iv, p. 178; Garrod, in Pharm. Journ., 1st ser., vol. xvii, p. 462, and vol. xviii, p. 174; Med. Times and Gaz., April, 1868, p. 876.

DESCRIPTION OF PLATE.

Drawn from a plant in the Garden of the Apothecaries' Company, Chelsea; the root-leaf added from a wild specimen from Devonshire. 1. A flowering branch. 2. The same, in fruit below. 3. A root-leaf. 4. Corolla cut open. 5. Vertical section of calyx and ovary. 6. Transverse section of ovary. 7. Ripe fruiting calyx. 8. Capsule. 9. Vertical section of the same. 10. Seed. 11. Section of the same. (2 reduced. 10, 11 much magnified.)

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Lithan. Addis et Nicc. lith

M&N Hanhart imp

JATEORRHIZA CALUMBA, *Miers.*

N. Ord. MENISPERMACEÆ.

Tribe *Heteroclinieæ*.

Genus Jateorhiza,* *Miers*. B. & H., Gen., i, p. 34; Baill., Hist. Pl., iii, p. 37 (*Chasmanthera*); Miers, Contrib., iii, p. 26. Species 2 or 3, natives of tropical Africa.

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13. Jateorhiza Calumba,† *Miers, in Hook. Fl. Nigrit., p.* 214, *note* (1849).

Calumba. Columbo.

Syn.—Menispermum palmatum, *Lam.* Menispermum Columba, *Roxb.* Cocculus palmatus, *DC.* Jateorhiza palmata, *Miers.* Jateorhiza Miersii, *Oliver.* Chasmanthera Columba, *Baill.*

Figures.—Berry, in Asiatic Researches, x, t. 5, cop. in Hayne, ix, t. 48, and in Nees, t. 364; Bot. Mag., t. 2970, 2971, cop. in Steph. & Ch., t. 160 (*J. palmata*), and in Woodv., v, 5; Miers, Contrib., iii, t. 90; Baill., l. c., figs. 16, 17.

Description.—A perennial herb, with a short, rounded, irregular rhizome, giving off numerous fleshy, swollen, fusiform, cylindrical roots 1—4 inches in diameter, tapering into fibres below, covered with a thin, dull-brown, nearly smooth skin, the surface of the flesh bright yellow, paler yellow within. Stems several, herbaceous, not more than ½ inch thick, twining and climbing widely, and reaching the summits of trees, slightly branched, green, rather thickly covered with stiff, spreading, gland-tipped hairs. Leaves alternate, at long intervals, on very long petioles, large, the blade reaching 14 inches wide by 10 inches long in large specimens, nearly orbicular, strongly cordate at the base, palmately lobed, the lower with 7—5 acute, entire lobes, the upper 3-lobed, dark green and slightly rough above, paler with prominent veins below, which as well as the margins are strongly hispid, thin and semi-membranaceous. Flowers dicœcious, about

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* Name from *ἰατήριος*, healing, and *ῥίζα*, a root, from its medicinal virtues.

† The name is here spelt *Columba*, as also by Roxburgh; but in his subsequent papers Miers spells it as above. It is derived from the native African name for the root, *Kalumb*.

$\frac{1}{2}$ inch diameter, nearly sessile, arranged on the divaricate branches of large, drooping, axillary, lax panicles, the male panicles 12—18 inches long, the female much shorter, rachis and branches setose-hispid, or nearly glabrous, bracts minute or none. Male flowers: sepals 6 in two rows, erect, strongly imbricate, oval-oblong, blunt, smooth; petals 6 in a single row, much shorter than the sepals, oval, pale green, blunt, incurved, so as to include the stamens; stamens 6, as long as the petals, and opposite to them, filaments slender, thickened upwards, and turned outwards at the top, anthers 4-celled, extrorse; carpels quite rudimentary or none. Female flowers (not seen): petals emarginate at the apex; stamens 6, sterile, half the length of the petals; carpels 3, free, erect, oblong, densely glandular-pilose, ovary 1-celled, with one ovule attached to centre of the inner angle, styles short, thick, stigmas with 2 or 3 spreading points. Fruit of 3 (or less by abortion) ovoid, fleshy drupes about the size of a hazel-nut, with a rather scanty pulp, putamen thin, densely covered with longish hairs, which are immersed in the pulp, rounded on the back, flattened on the inner side. Seed solitary, filling the fruit, curved both laterally and from above downwards, embryo buried in the abundant fleshy endosperm, which is transversely fissured on the inner side, cotyledons foliaceous, flattened, divaricate, radicle small, terete.

Habitat.—A native of forests in the Mozambique and Quilimane countries of Eastern tropical Africa, especially abundant along the course of the Lower Zambesi. It is also met with cultivated on the little islets of Ibo and Mozambique off the same coast. All the Calumba root of commerce comes from these Portuguese possessions. The plant has at various times been cultivated at Calcutta, in the Mauritius, the Seychelles, and Madagascar, and specimens may be seen in a flowerless state at Kew and the Botanic Society's Gardens.

The amount of hispidity is liable to great variation, and the leaves present a considerable range in size and difference in the form of the basal lobes. We have therefore followed Hanbury in combining *J. Calumba* and *J. palmata*, Miers (*J. Miersii*, Oliv.),

but have preferred to keep the former specific name to the latter; the two being of the same date.

Oliver, Fl. Trop. Africa, i, p. 42; Miers, Contrib. Bot., iii, p. 27; Roxb., Fl. Indica, iii, p. 807; Hook., in Bot. Mag., t. 2970-1; Lindl., Fl. Med., p. 369; Flück. & Hanb., Pharmacog, p. 22.

Official Part and Names.—Calumbæ Radix; the root, cut transversely and dried, of Jateorhiza Calumba, *Miers*, and J. Miersii, *Oliver* (B. P.). The root (*Calumbæ Radix*) of the above plants (I. P.). Calumba; the root of Jateorhiza palmata, *Miers* (Cocculus palmatus, *De Candolle*); and of Jateorhiza Calumba, *Miers* (Cocculus palmatus, *Wallich, Catal. non DC.*) (U. S. P.).

Collection, Preparation, and Commerce.—We have no recent information in reference to the collection and preparation of this drug for the market, the only notice on these points we possess being derived from Dr. Berry's 'Asiatic Researches,' dated as far back as 1808. From these it appears that the roots are dug up from wild plants in the hot and dry season (March), the fleshy tubercules are then separated from the short main root, and cut transversely into slices; these are dried in the shade, and constitute the *Calumba root, Calumba,* or *Columbo* of commerce. Calumba root is either shipped directly to Europe and the United States from Zanzibar, or it is obtained indirectly from Bombay and other Indian ports. It was formerly supposed from its name to be derived from Colombo, the capital of Ceylon; but, as already noticed, the English name is derived from *Kalumb,* the native African name for the root.

General Characters and Composition.—Calumba root or Columbo, as commonly met with in commerce, consists of irregular, flattish, circular or somewhat oval pieces, from one to two or more inches in diameter, and from $\frac{1}{8}$ to $\frac{1}{2}$ an inch or more in thickness. Cylindrical pieces from one to two inches long are also occasionally met with. The cortical part, which is separated from the central woody portion by a fine dark-coloured line, is thick, somewhat corky in texture, yellowish or dull greenish-yellow in colour, and is covered by a brownish-yellow, wrinkled, outer coat. The central or woody portion is of a greyish-yellow colour, more or less concave

on its two surfaces from contracting in the drying process in consequence of its spongy nature, and marked by evident radiating lines and faint concentric circles. Calumba root has a feeble musty odour; and a very bitter taste, more especially the cortical portion. It is very brittle, breaking with a mealy fracture, and is readily reduced to powder. The pieces are often perforated with small holes, which are caused by insects devouring the starch which it contains.

The principal constituents of Calumba root are *calumbin, berberia, calumbic acid,* and *starch.* It is entirely free from both tannic and gallic acid. The bitter taste and medicinal properties are due to the three first-named constituents. Starch constitutes, on an average, nearly one third of its weight; and hence a decoction of calumba root when cold is blackened by a solution of iodine. Calumbin or Calumba-Bitter, its principal constituent, is a neutral, peculiar, crystalline, colourless, bitter principle. Berberia is a bitter crystalline alkaloid of a yellow colour, which was first discovered in the common barberry (*Berberis vulgaris*); and which appears to exist in calumba root in combination with calumbic acid; the latter, when separated, is in the form of a yellowish amorphous powder. The yellow colour of calumba is due to berberia, or to this alkaloid in combination with calumbic acid. The best solvent of the active principles is alcohol; these principles are but very slightly soluble in water.

Adulterations and Substitutions.—According to our experience, calumba root is rarely or ever adulterated at the present time in this country, and it is, moreover, rare to find any other root or stem substituted for it. The only substitution that we have seen is, the substance that Hanbury described some years since, and which he proved to be the transverse slices of the stems of *Coscinium fenestratum,* a Menispermaceous plant, like that yielding the true calumba root, but obtained from Ceylon, and not Eastern Africa like it. The slices thus offered as calumba root are readily distinguished by their greater smoothness and hardness, and from not being contracted in their central portion. Of late years, these slices have been offered in the market in somewhat large

quantities, as the produce of the stems of the true calumba plant, but, as just noticed, their botanical and geographical sources are different. The sliced roots of White Bryony (*Bryonia dioica*), and of American or False Calumba (*Frasera Walteri*), have been also said to have been used as adulterants of, or substitutions for, true calumba root, but the structure of these two roots is so strikingly different from that of the genuine drug, that no one acquainted with its characters could be deceived. American Columbo is official in the Secondary List of the United States Pharmacopœia.

Medical Properties and Uses.—Calumba root is a bitter stomachic and mild tonic. Its especial value as a tonic resides in the fact of its not producing nausea, sickness, febrile disorder, or headache, like other remedies of the class to which it belongs. It has been found of great value in general debility, gastric irritability, to allay the vomiting frequently attendant on pregnancy, in atonic dyspepsia, and in the advanced stage of diarrhœa and dysentery when the inflammatory symptoms have subsided. As it contains neither tannic nor gallic acid, it undergoes no change when combined with salts of iron and alkalies, and it may therefore be frequently advantageously prescribed in conjunction with them.

Per. Mat. Med., by B. & R., p. 983; Pharmacographia, p. 23; U. S. Disp., by W. & B., p. 199; Garr., Mat. Med., p. 186; Pharm. Centr. Blatt. für 1830, S. 517, and 1831, S. 429; Amer. Journ. Pharm., vol. xx, p. 322; Chem. Gaz., vol. vii, p. 150; Pharm. Journ., 1st ser., vol. x, p. 321, and vol. xii, p. 185.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum cultivated in the Botanic Garden, Calcutta (Wallich, no. 4953A); the root added from a plant cultivated in Kew Gardens; the fruit copied from Miers. 1. Portion of stem of a male plant with leaves and flowers. 2. A male flower. 3. Vertical section of the same. 4. A petal with included stamen. 5 and 6. Stamens. 7. A ripe drupe. 8. The same with half the pulp removed. 9. The putamen with the woolly coat half removed. 10. A seed. 11. Vertical, and—12. Transverse section of the same. 13. Rhizome and roots. 14. Transverse section of a root. (2–6 enlarged.)

D'Hart, ad sicc. del. et lith.

M&N Hanhart imp.

ÆGLE MARMELOS *Correa*

N. Ord. RUTACEÆ.

Tribe *Aurantieæ*.

Genus Ægle,* *Correa*. B. & H., Gen., i, p. 306; Baill., Hist. Pl., iv, p. 488. Species 2, natives of tropical Asia.

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55. Ægle Marmelos,† *Correa in Trans. Linn. Soc. Lond.*, v, *p.* 223 (1800).

Bael. Bel. Bili. Bilva. Mahura.

Syn.—Cratæva Marmelos, *Linn.* C. religiosa, *Ainslie.*

Figures.—Rheede, Hort. Malab., iii, t. 35; Rumph., Herb. Amboin., i, t. 81; Roxb., Coromandel Pl., ii, t. 143; Wight, Ic. Pl. Ind., t. 16; Beddome, Fl. Sylv., t. 161.

Description.—A tree reaching a height of 30 or 40 feet when cultivated, with a short thick trunk and narrow oval head; in the wild state smaller and more irregular, with short, strong, sharp, spiny branches 1 inch or more in length in the axils of the leaves; bark bluish-grey, soft, with irregular furrows on the younger branches. Leaves alternate, compound, with one (rarely 2) pairs of shortly stalked opposite leaflets, and a larger long-petioled terminal one, leaflets 1—2 inches long, ovate or oval-ovate, abrupt or tapering at the base, somewhat attenuated towards the blunt apex, very shallowly serrato-crenate, smooth, thin, midrib prominent beneath. Flowers ¾ inch wide, sweet-scented, stalked, solitary or in few-flowered, lax, erect, axillary or terminal cymes. Calyx shallow, with 5 short, broad teeth, pubescent outside. Petals 5 (rarely 4), oblong-oval, blunt, thick, pale greenish-white, dotted with glands, imbricate, spreading. Stamens numerous, sometimes coherent in bundles, hypogynous, with short filaments half as long as the linear anthers. Disk none or very small. Ovary oblong-ovoid, slightly tapering into the thick short style which is again somewhat thickened upward, stigma capitate, axis of ovary wide,

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* *Ægle*, the name of one of the Hesperides, whose orchards bore golden fruit.

† *Marmelo* is Portuguese for Quince, and the fruit was called "Marmelos de Benguala" (Bengal Quince) by the mediæval writers.

cells numerous, 8—20, small, arranged in a circle, with numerous ovules in each cell. Fruit usually globose, 2—5 inches in diameter, pericarp nearly smooth, greyish-yellow, about $\frac{1}{8}$ inch thick, hard, filled with softer tissue becoming very hard and orange-red when dry; cells as in ovary. Seeds very numerous, somewhat compressed, ranged in closely packed tiers in the cells, and surrounded by a very tenacious, slimy, transparent mucus which becomes hard when dry; testa white, covered with woolly hairs immersed in the mucus, embryo with large cotyledons, and a short superior radicle; no endosperm.

Habitat.—The Bael tree grows throughout the Indian Peninsula in dry hilly places, reaching in the Western Himalaya to the altitude of 4000 feet. It is extensively cultivated and frequently planted near the Hindoo temples. It is also found either wild or cultivated in Java, Burma, and some other Eastern Asiatic localities.

The pretty sweet-scented flowers appear about May with the young leaves, and the fruit is ripe in October and November, remaining long on the tree. The cultivated Bael is often without the axillary spines. There is some variety in the size and form of the characteristic fruit which is found sometimes ovoid, pyriform or oblong, instead of the ordinary globular shape. The tree does not flower in our botanic gardens.

Hook. f., Fl. Brit. Ind., i, p. 516; Brandis, Forest Fl., p. 57; Lindl., Fl. Med., p. 162.

Official Part and Name.—Belæ Fructus; the dried half-ripe fruit (B. P.). The half-ripe fruit (*Belæ Fructus, Bael*) (I. P.). It is not official in the United States Pharmacopœia.

Collection and Commerce.—For medicinal use the fruit should be collected in a half-ripe state, and carefully dried, for if allowed to ripen, it entirely loses its astringent properties, and becomes a mild aperient. It is imported from Malabar and Coromandel.

General Characters and Composition.—Bael fruit, or as it is commonly called Indian Bael, is of a roundish form, about the

size of a large orange, and is covered with a hard woody rind. It is rarely imported entire, but is usually found in commerce in dried slices, or in fragments consisting of portions of the hard woody rind and adherent dried pulp and seeds. The rind is about 1½ lines thick, and is covered with a smooth, firmly adherent, pale brown or greyish epicarp, and, internally, as well as the dried pulp, has a brownish-orange or cherry-red colour. This colour of the pulp is, however, only superficial, for when broken it is seen to be colourless. It has no marked odour; but the taste of the pulp is mucilaginous and feebly acid, without any astringency, sweetness, or aroma.

According to the analyses of Professor Macnamara and Mr Pollock, bael fruit contains *tannic acid*, a *concrete volatile oil*, a *bitter principle*, and a *balsamic principle*, resembling in odour Balsam of Peru. But as an infusion of bael exhibits no perceptible change when acted upon by a per- or proto-salt of iron, the amount of tannic acid which it contains must be very small indeed; and Flückiger and Hanbury, speaking in reference to the above analyses, say that they are not able to give any confirmation to them, nor to "explain by any chemical examination upon what constituent the alleged medical efficacy of bael depends." According to them, the pulp when moistened with cold water yields a red liquid chiefly containing *mucilage*, and probably *pectin*.

Substitutions.—In this country the substitution of the dried rind of the Mangosteen fruit (*Garcinia Mangostana*), for Bael Fruit has been noticed by one of us, and described in the 'Pharmaceutical Journal.' Mangosteen rind may be readily distinguished from Bael fruit by its darker colour, greater thickness, absence of adhering pulp, easily separable epicarp, and by some of the pieces having upon them dark-coloured radiating wedge-shaped projecting processes (*stigmas*).

The fruit of *Feronia Elephantum*, Correa, which is commonly known under the name of Wood Apple, is also sometimes substituted for Bael fruit; as is also Pomegranate Peel, which will be hereafter described under the head of Punica Granatum. The

characters of both these fruits are, however, so different from those of Bael fruit that they cannot well be mistaken for it.

Medical Properties and Uses.—Bael fruit is said to possess astringent properties, and in India it is regarded as a valuable and efficacious remedy in diarrhœa, dysentery, habitual constipation, and irregularity of the bowels. As tried, however, in this country, it does not appear to be superior, or even equal in value, to some of the other official vegetable astringents in common use. Some of the difference observable in the remedial effects of Bael fruit as used in this country and in India is doubtless due to the fact of the dried fruit being here used, whilst in India it is employed in a fresh state.

Other Products of the Bael Tree.—The ripe fruit, which is known in India as the Bengal Quince, is said to have a very agreeable odour and taste. It is described as a mild aperient, and the juicy pulp when mixed with water and sweetened, is employed as a refrigerant drink in fevers and inflammatory affections attended with thirst. A preserve and a jelly are also prepared from the ripe fruit with sugar, and are said to be beneficial in habitual costiveness.

The bark of the root and stem, the flowers, and the expressed juice of the leaves, are also employed medicinally by the natives of India; but they do not appear to possess any very marked properties.

Per. Mat. Med., vol. ii, pt. 2, p. 549; Per. Mat. Med., by B. & R., p. 918; Pharmacographia, p. 116; U. S. Disp., by W. & B., p. 168; Pharmacopœia of India, p. 46; Pharm. Journ., vol. x, 1st ser., p. 165; Indian Ann. of Med. Sci., vol. ii, p. 233; Pollock, in Lancet, July, 1853, and Martin, in Lancet, 1853, vol. ii, p. 53; Bentley, in Pharm. Journ, vol. viii, 2nd ser., p. 654.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected by Horsfield in Java. 1. A flowering branch. 2. A stamen. 3. Calyx and pistil. 4. Section of the same. 5. Section of ovary. 6. Transverse section of half-ripe fruit. 7. Ripe fruit. 8. Seed. 9. Section of the same. (2–5 enlarged.)

D'Blair ad sicc. del. et lith.

M&N Hanhart imp.

PICRÆNA EXCELSA *Lindl.*

N. Ord. SIMARUBACEÆ.

Tribe *Simarubeæ*.

Genus Picræna,* *Lindl.* B. & H., Gen., i, p. 311; Baill., Hist. Pl., iv, p. 494. Species 3, natives of tropical America.

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57. Picræna excelsa, *Lindley, Fl. Medica, p.* 208 (1838).

Jamaica Quassia. Bitter Wood. Bitter Ash.

Syn.—Quassia excelsa, *Swartz.* Q. polygama, *Lindsay.* Simaruba excelsa, *DC.* Picrasma excelsa, *Planchon.*

Figures.—Trans. Royal Soc. Edinburgh, iii, t. 6, cop. in Hayne, ix, t. 16, and Woodville, vol. v; Nees, t. 381; Steph. & Ch., t. 173 (from a specimen in Linnæus' herbarium); Baill., iv, fig. 472.

Description.—A tree, 50—60 feet high, with a straight, thick, erect trunk and spreading branches, bark rather smooth, brownish-grey, wrinkled; the extremities with a short rufous down. Leaves alternate, with small deciduous stipules, pinnate with 4 or 5 pairs of leaflets and a terminal one, covered with fine, fulvous down when young; leaflets equal, shortly stalked, 2—4 inches long, ovate- or oval-oblong, acute at the apex, somewhat tapering and usually unequal at the base, entire, leathery, glabrous, paler and with prominent veins below. Flowers small, stalked, polygamous (bisexual and male), arranged in dense, much branched, corymbose-paniculate cymes, which are often extra-axillary, not so long as the leaves. Bisexual flowers: calyx flat, with 5 distant, very small, ovate, acute, persistent teeth. Petals 5, alternate with the calyx-teeth, ovate-oblong, about $\frac{1}{12}$ inch long, pale yellowish-green, valvate in bud. Stamens 5, alternating with the petals, inserted at the lower part of the large hypogynous disk, about as long as the petals, filaments tapering, hairy on the inside, anthers subglobose, yellow. Carpels usually 3 (sometimes 2), elevated on a large, thick, rounded disk or gynophore, ovaries 1-celled, slightly united, globular, quite smooth, styles united in the lower half, separate above, forming 3 (or 2) simple, spreading branches, much

* Name from πικρός, bitter.

exceeding the stamens. Male flowers: petals more delicate, oval-lanceolate and spreading, stamens longer than the petals, no trace of carpels or gynophore, otherwise as the bisexual flowers. Fruit consisting of 1—3, often 2, separate, black, shining, nearly spherical drupes about the size of a large pea, supported on the hardened, stalk-like gynophore, and with a short point on the inner side marking the position of the style; pulp scanty, endocarp crustaceous, thin, yellow, thicker at the inner side. Seed solitary, attached by a broad hilum to the base of the inner side of the drupe, which it completely fills, testa thin, marked with ramifying vessels, embryo homogeneous, soft and fleshy, undivided, with a small radicle; no endosperm.

Habitat.—This large tree is common in the Island of Jamaica, and is also found in some other West Indian Islands, as St. Kitts, Antigua, and St. Vincent. Its foliage and habit are not unlike those of the common Ash, whence one of its colonial names. The flowers appear in October and November, and the fruit is ripe in December and January. Small trees are grown in the stoves of botanic gardens, but the plant has not yet flowered, at least at Kew.

Lindsay, in Trans. Royal Soc. Edinburgh, 1794, p. 205; Swartz, Fl. Ind. occid., ii, p. 742; Grisebach, Fl. Brit. W. Indies, p. 140; Lindl., Fl. Med., p. 208.

Official Part and Names.—Quassiæ Lignum; the wood (B. P.). The wood (*Quassiæ Lignum*) (I. P.). Quassia; the wood (U. S. P.).

Commerce.—Quassia wood is exported from Jamaica, the amount in 1873 being about 60 tons.

General Characters and Composition.—Quassia wood, or as it is also called Bitter wood (or sometimes Jamaica Quassia wood, to distinguish it from the original quassia wood, which is the produce of *Quassia amara*, L., a native of Surinam, and therefore known as Surinam Quassia wood, and which is described below under the heading of Adulterations and Substitutions), is imported in billets or logs of varying size, but often as thick as a man's thigh, and several feet in length. These billets, which are

obtained from the trunk and larger branches, are covered by a smoothish bark, which has a dark grey colour externally, and is white and fibrous internally. In the quassia of commerce this bark is commonly removed, and the wood, which is tough, and of a very pale yellowish-white colour, alone employed in medicine. As found in the shops it is in the form of chips or raspings. Quassia wood has no odour, but an intense and pure bitter taste.

The bitter taste and medical properties of Quassia wood are especially due to the presence of a neutral crystallisable principle, termed *quassin* or *quassite*, which exists in it in the proportion of about $\frac{1}{10}$ per cent. Quassin is soluble in dilute alcohol, in chloroform, and in about 200 parts of water, but is insoluble in ether. Quassia wood contains no tannic acid or other astringent matters.

Adulterations and Substitutions.—The chips of other woods have been sometimes substituted for, or used as adulterants of, those of quassia. The intense and pure bitterness of the genuine drug will generally distinguish it. The infusions of other woods are also commonly changed to black or blueish-black by a persalt of iron, in consequence of the presence in them of tannic acid; but as quassia chips contain no astringent acid, no such effect is produced under like circumstances on their infusion.

Besides the official Quassia wood of the British, Indian, and United States Pharmacopœias, there is another kind of Quassia which is used in France and Germany, and, indeed, the German Pharmacopœia of 1872 forbids the use of any other quassia. This quassia is the one already alluded to as derived from *Quassia amara*, L., and termed Surinam quassia from its geographical source. This kind was the original quassia of the Materia Medica, and the one upon which the reputation of quassia as a medicine was established; but as the tree yielding it was of small size, the demand for it soon exceeded the supply, and the present official quassia became entirely substituted for it in this country and the United States of America. It is in cylindrical pieces, covered by a thin, easily separable, greyish-white bark. It has no perceptible odour, but a pure bitter taste; and in its chemical and medical properties it closely resembles the Jamaica or official quassia wood.

Medical Properties and Uses.—Quassia wood is a pure bitter tonic and stomachic. It also possesses anthelmintic properties, and is supposed by some to be narcotic, as it acts as a narcotic poison on flies, and also, it is said, on some of the higher animals. In overdoses it causes vomiting. It is a valuable remedy in atonic dyspepsia, in debility, and in convalescence after acute diseases. It has also been administered with success as an antiperiodic in fevers; and as an enema to destroy thread-worms in children. As it contains no tannic acid, it is frequently given in combination with chalybeates.

The *bitter-cups* now frequently sold, are manufactured from quassia wood.

Like other pure bitters, its infusion may be used to preserve animal matters from decay. The *Papier mouri*, which is largely used to destroy flies, is prepared from an infusion of quassia sweetened with sugar. Quassia is also very extensively employed by brewers, &c., as a substitute for hops in the manufacture of beer and ale.

Per. Mat. Med., vol. ii, pt. 2, p. 392; Christison's Disp., p. 763 Pharmacographia, p. 118; Waring's Therapeutics, 2nd edit., p. 602; U. S. Disp., by W. & B., p. 720; Liebig's Annalen d. Pharm., vol. xxi (1837), p. 40; Parrish, in Amer. Journ. of Pharm., vol. xxix, p. 104; Whipple, in Pharm. Journ., vol. xiii, 1st ser., p. 642.

DESCRIPTION OF PLATE.

Drawn from specimens in the British Museum collected in Jamaica (Dr Wright) and St. Kitts (Masson).

1. A branch with bisexual flowers.
2. A hermaphrodite flower.
3. The same with the petals removed.
4. Section of the same.
5. A stamen.
6. Fruit.
7. A single drupe seen from the inner side.
8. Vertical section of the same.
9. A male flower.
10. A stamen from the same.

(2–5 and 8–10 enlarged.)

D.Blair ad nat. del. et lith.

M&N.Hanhart i

RHAMNUS FRANGULA, *Linn.*

N. Ord. RHAMNACEÆ.

Tribe *Rhamneæ*.

Genus Rhamnus, *Linn.*

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65. Rhamnus Frangula,* *Linn., Sp. Plant, ed.* 1, *p.* 193 (1753).

Black Alder. Berry-bearing Alder. Alder Buckthorn.

Syn.—Frangula vulgaris, *Reichenbach.*

Figures.—Hayne, v, t. 44; Nees, t. 359; Berg & Sch., t. 19 f; Syme, E. Bot., ii, t. 319; Sturm, Deutschl. Fl., heft 95, t. 3.

Description.—A slender, somewhat straggling bush about 6—12 feet in height, with a smooth purplish-grey bark with white lenticels, branches never terminating in spines, extremities of young branches, buds and petioles with a short fulvous down. Leaves alternate with very small, triangular-linear, deciduous stipules, rather long-stalked, blade $1\frac{1}{2}$—$2\frac{1}{4}$ inches long, oval or slightly obovate-oval, rounded or abrupt at the base, usually somewhat attenuated at the apex, quite entire, rather flaccid and undulated, smooth, bright green, veins very sharp and prominent beneath, the lateral ones, 7—10 on each side, slightly curved and parallel. Flowers bisexual, very small, on slender drooping stalks in small clusters of 2—5 in the axils of the leaves. Calyx with a bell-shaped tube, puberulous outside, and 5 ovate-triangular segments, pale-green, tinged with whitish-pink. Petals 5, inserted above the calyx-tube, not so large as the calyx-segments with which they alternate, margins involute. Stamens 5, inserted opposite and immediately in front of the petals, by which they are partially enfolded, filaments very short, anthers rounded. Ovary enclosed in the calyx-tube, depressed, 3-lobed, 3-celled; style very short, thick, stigma faintly 3-lobed. Fruit berry-like, when ripe about the same size as that of *R. catharticus*, and like it surrounded at the base by the persistent flattened circular piece

* *Frangula*, probably from *frango*, to break, the mediæval name for this bush; from its brittle stems?

of the calyx-tube, green when young, passing through white, pale yellow, and pink to purplish-black when ripe, on somewhat deflexed stalks over ¼ inch long; pericarp thin, pulp thin, watery; pyrenes 2 (rarely 3), rather unequal, rounded in outline, compressed, flattened on inner, convex on outer surface, bony, smooth, yellow, the inner surface marked down the whole centre by a faint line. Seed solitary in the pyrene and similar to it in form, testa thin and yellow, closely invested by the pyrene, except at the base which protrudes beyond it and is white, hard, rounded, and bony, somewhat two-lipped; embryo bright green, cotyledons large, plane, pressed together, plumule minute, radicle small, projecting, pointing to one side of the hilum; endosperm solid, scanty, at the sides of the cotyledons.

Habitat.—This rather pretty shrub is a native of this country in woods, bushy places, and hedges, where it is by no means uncommon, especially on damp or clay soils; becoming, however, very rare in Scotland. It is found throughout Europe, extending also into Siberia, the Caucasus, and the Mediterranean coast of Africa. It flowers in early summer, and the fruit is ripe in July.

The very different structure of the pyrenes in this plant from that in *R. catharticus* (in spite of the external similarity of their fruits), taken along with the flat cotyledons and the hermaphrodite flowers with a quinary symmetry, certainly afford strong grounds for retaining the old genus *Frangula* (as has been done by Brongniart, A. Gray, and J. J. Bennett) apart from *Rhamnus*, but the authors of the 'Genera Plantarum' give reasons against that step, and we have thought it best in this case to follow the generally received nomenclature.

Syme, E. Bot., ii, p. 228; Hook. f., Stud. Fl., p. 83; Wats., Comp. Cyb. Br., p. 136; Gren. & Godr., Fl. France, i, p. 338; Ledebour, Fl. Ross., i, p. 503; Boiss., Fl. Orient., ii, p. 21; Lindl., Fl. Med., p. 167.

Part Used and Name.—Rhamni Frangulæ Cortex; the bark of the young trunks and of the larger branches. It is not official in the British Pharmacopœia, the Pharmacopœia of India, or the

Pharmacopœia of the United States. But it is official in the German Pharmacopœia and some other European Pharmacopœias.

Collection.—The bark should be obtained in the spring from the young trunks and large branches, and carefully dried; that obtained from the old trunks should not be collected, as it is altogether different in taste and other characters from the younger bark.

General Characters and Composition.—The official Cortex Rhamni Frangulæ of the German and other European Pharmacopœias, is also commonly known as Black Alder, and Alder Buckthorn bark. It is in small quills, averaging about ½ a line in thickness. It has a grey, brownish-grey, or blackish-brown colour externally, and is marked by whitish, warty, transversely lengthened protuberances. Internally it is smooth and brownish-yellow. It has a compact, somewhat fibrous texture; and is without any marked odour; but with a pleasant, sweetish taste. Baildon, of Edinburgh, who has recently recommended this bark for medicinal use in Great Britain, says that the bark in small quills should alone be used, as that "taken from the thick part of the trunk is altogether different, and the decoction made from it is nauseous to the taste, whereas that made from the quilled bark is singularly pleasant, with a slight almond or prussic acid flavour."

Black alder bark has been analysed by Gerber, Binswanger, Buchner, and other chemists. The principal constituents appear to be *Rhamnoxanthin* or *Frangulin;* two *resins,* one soluble in ether, and the other soluble in alcohol, but insoluble in ether; a *bitter matter* also of a resinous nature; a little *tannic acid;* and *extractive matter.* Rhamnoxanthin is a yellow crystallisable colouring principle. It is accompanied, according to Casselmann, by an amorphous resinous yellow substance, and is most abundant in the bark of the older branches, that of the younger branches containing a larger proportion of the resinous constituent. We have no positive evidence of the constituent in which resides the purgative property of the bark, but Binswanger attributed it to the bitter matter of a resinous nature. This bitter matter of

Binswanger is probably the same as the amorphous yellow resinous substance of Casselmann, and the existence of this principle and rhamnoxanthin in varying proportions in the bark of the older and younger branches is probably the cause of the difference of taste, &c., in these two barks as noticed above; and moreover, as the younger bark is generally regarded as the more active, we have further evidence that the amorphous resinous yellow substance or bitter matter? is the purgative principle.

Medical Properties and Uses.—In Germany, Holland, and some other parts of Europe, black alder bark has long been employed as a purgative, and it has lately been highly recommended for the same purpose in Great Britain. Its action is said to be as mild as that of castor oil, and as certain as that of senna; and from its comparatively pleasant taste to that of senna and other purgatives to be especially adapted for children. It is also said to be extremely valuable in counteracting habitual constipation. The best forms of administration are stated to be the fluid extract and decoction.

Watts' Dict. Chem., vol. ii, p. 706, and vol. v, p. 100; Royle's Mat. Med., by J. Harley, p. 670; Pharm. Journ., vol. ii, 1st ser., p. 721, and vol. ix, p. 537; Buchner, Journ. de Pharm., 3rd ser., vol. xxiv, p. 293; Phipson, Compt. rendus, vol. xlvii, p. 153; Casselmann, Ann. Ch. Pharm., vol. civ, p. 77; Buchner, Jahresber., 1853, p. 536; Baildon, in Pharm. Journ., vol. ii, 3rd ser., p. 152, and vol. iv, p. 889; Ince, in Chemist and Druggist, June, 1874; Baildon, in Year Book of Pharmacy, 1874, p. 544; Umney, in Pharm. Journ., vol. v, 3rd ser., p. 21.

DESCRIPTION OF PLATE.

Drawn from specimens collected in the Isle of Wight by Mr. F. Stratton, and near Sevenoaks, Kent. 1. A branch in flower. 2. A flower. 3. Vertical section of the same. 4. A petal and stamen. 5. Side view of a stamen. 6. Pistil. 7. Section of ovary. 8. A branch with fruit. 9. Vertical, and—10. Transverse section of fruit. 11. Base of fruit. 12 and 13. Inside, and—14. Outside view of a pyrene. 15 and 16. Vertical, and—17. Transverse section of the same. (2–7, 9–11, 13–17 enlarged.)

D.Blair ad nat. del. et lith.

M&N.Hanhart imp.

RUBUS VILLOSUS, *Aiton.*

N. Ord. Rosaceæ.

Tribe *Rubeæ*.

Genus **Rubus**,* *Linn.* B. & H., Gen., i, p. 616; Baill., Hist. Pl., i, p. 454. Species variously estimated at 500 or 100, found in all parts of the world.

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100. Rubus villosus, *Aiton, Hort. Kewensis,* ii, *p.* 210 (1789).

Common (American) *Blackberry. High Blackberry.*

Figures.—Barton, ii, t. 39; Bigelow, ii, t. 38.

Description.—A bush 2—7 feet in height, with a woody, horizontal, irregularly nodular, reddish-brown root-stock, and semi-shrubby, biennial, upright, or nearly prostrate, weak, furrowed, smooth, reddish stems, furnished with strong, hooked prickles; the younger branches green, covered with glandular hairs and fine prickles. Leaves alternate, on long, hairy and glandular petioles, with small, lanceolate, acute stipules at the base, trifoliolate, the lower leaflets nearly sessile, sometimes pedately divided into two, the terminal one conspicuously stalked, leaflets ovate, acute, rounded at the base, coarsely and irregular serrate, rough above, hairy and glandular beneath. Flowers varying in number and size, arranged in lax terminal racemose or corymbose cymes, stalks long, hairy, bracts small. Calyx deeply divided into 5 ovate, sharply-pointed segments, shortly hairy externally, smooth within, spreading during flowering, afterwards deflexed, persistent. Petals 5, obovate-oblong or oval, spreading, very shortly clawed, white, soon falling. Stamens very numerous, perigynously inserted on the margin of the short, spreading calyx-tube, filaments long, slender, anthers small, with rounded cells. Carpels numerous, separate, placed on a conical receptacle; ovaries smooth, styles filiform, slightly lateral, stigmas simple. Fruit consisting of numerous separate rounded drupes inserted on the somewhat enlarged and fleshy receptacle, the whole supported by the reflexed persistent calyx, and forming an ovoid or rounded head, deep shining black when ripe; pulp juicy, abundant, endocarp (nut or

* *Rubus*, the classical name for a bramble.

stone) bony and hard, marked with minute excavations. Seed solitary, filling the stone, pendulous, with plane-convex cotyledons and a short radicle; no endosperm.

Habitat.—This is the commonest Blackberry of the United States of America, being found everywhere from south to north in dry situations, as roadsides, borders of fields and thickets, &c.; in Canada it is less frequent. It is exceedingly variable in habit, the shape and size of the flower and fruit, and the amount of glandular hairiness of its stems and petioles. The flowers appear in May and June, and the large and very sweet fruit is ripe in August and September. Though very like some European species, it is considered by those who have specially studied this difficult group of plants to be quite distinct from any of them, though coming nearest to *R. suberectus*, Anders. The bush is in cultivation in a few botanic gardens here.

A. Gray, Man. U. S. Bot., p. 157; Chapman, Fl. S. States, p. 125; Hook., Fl. Bor.-Amer., i, p. 179; Lindl., Fl. Med., p. 227.

Official Part and Names.—RUBUS, *Blackberry;* the bark of the root of Rubus Canadensis, and of Rubus villosus (U. S. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of India. In the Pharmacopœia of the United States, issued in 1863, the entire root was official; but the *bark* of the root is now alone recognised. It should also be noticed that the bark, although official under the common name of Blackberry, is ordered to be obtained from two distinct plants—the one, *Rubus canadensis*, being the American Dewberry; and the other—*Rubus villosus*, the American Blackberry.

General Characters and Composition.—The roots of both the blackberry and dewberry are more or less cylindrical and branched, and vary in size from that of a common quill to about an inch in diameter. They consist of a thin bark and a central woody portion or meditullium; and as the latter is nearly inert, the bark is alone official. The dried bark of the blackberry has a brownish or reddish-brown colour, and is marked with longitudinal wrinkles; that of the dewberry has a dark-ash colour, and

presents transverse fissures, but has no longitudinal furrows. Both barks are without odour, but have a bitter and strongly astringent taste.

The virtues of the bark are extracted both by boiling water and diluted alcohol, and depend essentially, if not entirely, on *tannic acid*.

Medical Properties and Uses.—The fruits of various species of Rubus, as well as the young tops, flowers, and leaves, have for ages had a popular reputation as astringents, but in Great Britain they have never been used in regular medical practice. In the United States, however, the official blackberry bark has acquired much reputation as a mild tonic and powerful astringent; and no difference is said to be observable in the effects of the bark of the two roots. Dr. Wood, speaking of these roots, says, "They have long been a favourite domestic remedy in bowel affections, and from popular favour have passed into regular medical use. Given in decoction they are usually acceptable to the stomach without being offensive to the taste; and may be employed with great advantage in cases of diarrhœa from relaxation of the bowels, whether in children or adults. We can add our own decided testimony to that of others who have spoken favorably of their use in this complaint; and there is no doubt that they are applicable to all other cases in which the vegetable astringents are found serviceable."

Gerard's Herball, by Johnson (1636), p. 1274; Wood's Therapeutics and Pharmacology, vol. i, p. 128; U. S. Disp., by W. & B., p. 746.

DESCRIPTION OF PLATE.

Drawn from a plant in the Garden of the Apothecaries' Company, Chelsea.

1. A young branch with flowers.
2. Vertical section of a flower.
3. A petal.
4. Fruit.
5. Vertical section of a drupe.
6. The stone deprived of its pulp.

(2, 5, 6 enlarged.)

D.Blair ad nat. del. et lith.

M.& N.Hanhart

ARTEMISIA ABSINTHIUM, *Linn.*

N. Ord. COMPOSITÆ.

Tribe *Anthemideæ*.

Genus **Artemisia**,* *Linn.* B. & H., ii, p. 435. Species 150—200, natives almost entirely of the northern hemisphere in both old and new worlds.

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156. Artemisia Absinthium,† *Linn., Sp. Plant., ed.* 1, *p.* 848 (1753).

Wormwood.

Syn.—Absinthium officinale, *Lam.*

Figures.—Woodville, t. 22; Hayne, ii, t. 11; Nees, t. 235; Steph. & Ch., t. 58, 2nd fig.; Berg & Sch., t. 22 b; Syme, E. Bot., v, t. 731; Reichenb., Ic. Fl. Germ., t. 1029.

Description.—An herbaceous perennial, with a rather large, woody rootstock, giving off short barren leafy shoots and upright branched flowering stems. Stems 1—3 feet high, stiff, almost woody at the base, furrowed, silky with adpressed white hairs, branches short, ascending. Leaves all finely pubescent with close silky hairs, greyish-green above, almost white beneath, those of the barren shoots and base of the stem long-stalked, broadly ovate in outline, tripinnatisect, with the ultimate segments short, oblong, blunt, those higher up bipinnatisect, pinnatisect, and (the highest ones) simple, with the ultimate segments linear-oblong, acute, entire. Heads very numerous, about $\frac{1}{6}$ inch wide, hemispherical, nodding, on short, slender stalks from the axils of longer linear leaves, and with a few small linear bracts below the involucre, arranged in numerous erect, lax, somewhat unilateral, slender racemes at the upper part of the stem and branches, the whole forming a dense pyramidal, leafy inflorescence; involucral-scales in two or three rows, imbricated, obovate, blunt, with a green centre and scarious margins, pube-

* *Artemisia*, the classical name for *A. arborescens*, L.? or some allied species dedicated to the goddess Ἄρτεμις, the Roman Diana.

† *Absinthium*, in Greek ἀψίνθιον, the classical name for several species of this genus.

scent on the back; receptacle rounded, set with long hairs. Flowers about 40 in a head, the outer row female, the inner bisexual or male, corollas yellow, all tubular, the female narrow, with 2 or 3 short teeth, the bisexual 5-toothed. Anthers acute-tongued at the apex, not tailed at the base. Styles of the female flowers large, the branches recurved; of the hermaphrodite flowers smaller, the branches truncate, with brush-like ends. Fruit small, obovoid, smooth, without a pappus or crown of any sort.

Habitat.—Wormwood is not a very common plant in this country, but is found locally in all parts except the north of Scotland, growing by roadsides, on waste ground, and rubbish, especially near the coast, no doubt in many places the remains of cultivation. It grows throughout Europe (except Scandinavia), and in Algeria and Western Asia to N.W. India; it has also become naturalised in the United States. Its cultivation for use is carried on at Mitcham and other places in this country. It has an unusually strong and pleasant aromatic odour, but there is an insipid form found in Russia; there is also a variety with larger heads occasionally met with.

Syme, E. Bot., v, p. 61; Hook. f., Stud. Fl., p. 203; Wats., Comp. Cyb. Brit., p. 266; Ledebour, Fl. Ross., ii, p. 598; Gren. & Godr., Fl. France, ii, p. 126; Boiss., Fl. Orient., iii, p. 373; DC. Prod., vi, p. 125; Lindl., Fl. Med., p. 464.

Official Parts and Names.—ABSINTHIUM, *Wormwood;* the tops and leaves (U. S. P.). It is not now official in the British Pharmacopœia, or the Pharmacopœia of India; but it was formerly official in the London, Edinburgh, and Dublin Pharmacopœias.

Collection.—It should be gathered in July or August, when the plant is in flower; the leaves and flowering tops should be alone employed, and when carefully dried their properties are unimpaired and long retained.

General Characters and Composition.—Wormwood has a whitish-grey colour, a soft silky feel, a strong, peculiar, somewhat aromatic and unpleasant odour, and an intensely bitter, slightly aromatic, and to most persons disagreeable taste. Pereira says the

cold infusion becomes olive-green and turbid on the addition of perchloride of iron. It imparts its properties to both water and spirit.

The principal constituents of wormwood are a *volatile oil*, a bitter principle called *absinthin*, and an acid called by Braconnot *absinthic acid*. The so-called *salt of wormwood* is impure carbonate of potash, and is obtained by incinerating the herb. Absinthic acid is now regarded as identical with succinic acid. The volatile oil, which is isomeric with camphor, has usually a dark green colour, but is sometimes yellow or brown; it has an acrid bitter taste, and the peculiar odour of wormwood. Absinthin is the active bitter principle of the plant; it is an imperfectly crystalline substance, which is slightly soluble in water, very soluble in alcohol, but less so in ether.

Medical Properties and Uses.—Wormwood formerly enjoyed a high reputation as an aromatic tonic, and was also regarded as an anthelmintic, as its common name implies; but it is little employed at the present time, either in this country or the United States, although, as Christison remarks, there seems no reason for the present neglect of it except the caprice of fashion. It is stated to be especially serviceable in atonic dyspepsia; and was largely used in intermittents before the introduction of Cinchona bark. It has also been successfully employed to expel worms; and the freshly powdered root has proved very efficacious in epilepsy.

In large doses it appears to exert a specific influence over the nervous system, as it produces headache, giddiness, &c. These effects are due to the volatile oil, which appears to resemble camphor in its action. It exhibits its narcotic effects on the lower animals by causing epileptiform convulsions, and in large doses, death. A case is recorded in the 'Lancet' in which a man, after taking half an ounce of the volatile oil, became insensible, and was attacked with convulsions, &c., but who recovered under suitable treatment by emetics, stimulants, and demulcents.

This action of the volatile oil appears to throw some light on the statements that have been frequently made of late years, in reference to the highly injurious effects of the long-continued and

excessive use of the liqueur now so largely taken in France and some other parts of the Continent, under the name of *Absinthe*, and which consists essentially of alcohol mixed with the volatile oil of wormwood, and to which some other vegetable ingredients, as angelica, anise, fennel, &c., are added. It is said that the effects produced by absinthe are essentially different from those caused by pure alcoholic drinks. These effects have been designated by the name of *absinthism*, and are characterised, amongst other symptoms, by great restlessness and disturbing dreams at night, trembling of the hands and tongue, giddiness, tendency to epileptiform convulsions, &c. These effects resemble those produced by the volatile oil of wormwood, and hence, although entirely discrediting the absurd and extravagant statements that have been made on the highly injurious action of absinthe, it seems at least probable that the abuse of absinthe is even more dangerous than that of the purer alcoholic drinks.

Per. Mat. Med., vol. ii, pt. 2, p. 23; Christison's Disp., p. 2; U. S. Disp., p. 4; Waring's Man. of Pract. Therap., p. 136; Amer. Journ. Pharm., vol. xxiii, p. 358; Luck, Ann. Chim. Pharm., vol. lxxviii, p. 87; Lancet, Dec. 6, 1862, p. 619; Boston Med. and Surg. Journ., March 5 and 12, 1868, pp. 69 and 83; Pharm. Journ., vol. x, 2nd ser., p. 30; Year Book of Pharm. for 1873, p. 348.

DESCRIPTION OF PLATE.

Drawn from a plant in the Royal Gardens, Kew, flowering in August.

1. Top of flowering stem.
2. A flower-head.
3. Section of the same.
4. A male flower.
5. A female flower.
6. An anther.
7. Upper part of style.
8. A root-leaf.

(2–7 enlarged.)

D.Blair ad nat. del et lith.

M & N. Hanhart imp.

TAXUS BACCATA, *Linn*

N. Ord. CONIFERÆ. Le Maout & Dec., p. 739.

Tribe *Taxineæ*. Lindl., Veg. K., p. 230 (N. Ord.).

Genus Taxus,* *Linn.* Parlatore, in DC. Prod., xvi, 2, p. 499. Species 6, natives of temperate parts of the northern hemisphere.

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253. Taxus baccata, *Linn., Sp. Plant., ed.* 1, *p.* 1040 (1753).

Yew.

Icon.—Nees, t. 88; Richard, Comm. de Conif., t. 2; Schnitzlein, Iconog., t. 78; Syme, E. Bot., viii, t. 1384; Reichenb., Ic. Fl. Germ., xi, t. 538; Nees, Gen. Fl. Germ.

Description.—An evergreen tree, usually 20—30 feet high, but sometimes much taller, with a very large and thick trunk and widely-spreading horizontal branches, bark dark-brown, furrowed, shredding off in fibres, young twigs green. Leaves very numerous and closely placed, alternate, with a very short petiole which is continued as a raised band down the stem, articulated, ½—1 inch long, somewhat curved, linear-strap-shaped, sharp-pointed but not prickly, entire, rather thick, dark shining green above, pale beneath, midrib prominent, all pointing somewhat upwards right and left by a twist in the petioles; buds very small, axillary, clothed with little scales. Flowers dicœcious; the male in catkins, the female in cones; all axillary. Male catkins ovoid, scarcely ¼ inch wide, consisting of a rather thick axis with several closely placed, thin, imbricated, yellowish gradually diminishing scales on its lower half, and on its upper half about 10—20 closely placed nearly sessile sulphur-yellow anthers, forming a subglobular head; anther-connective peltate, lobed, with 4—7 cells attached to its under surface, and dehiscing longitudinally, pollen globose. Female cones reduced to very small bud-like bodies consisting of several rows of small, imbricated scales surrounding a single, terminal, erect, urceolate ovule, with a small annular "aril" at its base, coat of the ovule prolonged above into a nipple-shaped tube which projects beyond the topmost bracts of the cone.

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* *Taxus*, the classical name.

Fruit (galbulus) consisting of a small seed ("nut"), closely surrounded and covered except at the summit by the greatly enlarged "aril" which has become a berry-like fleshy cup, the whole supported on a small circular base formed of the cone-scales, from which the "berry" is readily separated; cup somewhat exceeding the nut, with a sharp edge above, skin thin but strong, coral-red, filled with a thick, glutinous, nearly colourless juice; "nut" loosely attached to the axis by a broad base, about ¼ inch long, roundish ovoid, bluntly pointed and obtusely 3 or 4 angled above, dark ruddy brown, smooth, minutely pitted under a lens, covered with a thin papery pale brown skin and a very thin layer of brown semifluid pulp, inner coat hard, bony, pale yellow; embryo small straight, with 2 short cotyledons and a superior radicle, lying in the axis of the tough endosperm.

Habitat.—The yew is chiefly familiar as a planted tree, especially in churchyards, but it grows wild in many parts of England, principally on chalk and limestone, where it sometimes forms small woods or groves. On the chalk downs of the southern counties are found trees of undoubtedly very great antiquity. It is a native of the whole of Central and Southern Europe, and extends to North Africa, Asia Minor, the Amur district to the Himalaya, ascending in Sikkim to an elevation of 7000—10,000 feet. There are many garden varieties cultivated, of which the best known are *T. fastigiata,* Lindl., with an upright pyramidal habit of growth, and *T. hibernica,* Mack., with yellow "berries." Some botanists consider that there is but one kind of yew, and that the American and Japanese species should all be referred to *T. baccata.*

What are above described as anthers are perhaps better considered to be antheriferous bracts, and the anther-cells as anthers. Some authors describe the stamens as monadelphous.

Syme, E. Bot., viii, p. 276; Hook. f., Stud. Fl., p. 348; Watson, Comp. Cyb. Brit., p. 320; Loudon, Arb. et Frut. Brit., iv, p. 2066; Parlatore, l. c., p. 500.

Parts Used and Names.—Taxus, *Yew;* the leaves and fruits.

It is not official in the British Pharmacopœia, or the Pharmacopœia of India, or the Pharmacopœia of the United States.

General Characters and Composition.—The leaves have an acrid, bitter, disagreeable taste, and an unpleasant odour. The red succulent cup of the fruit has a sickly taste, but it is, however, frequently eaten by children, and also by birds, wasps, &c.; it has no marked odour.

The leaves contain a *volatile oil, tannic* and *gallic acids*, and a resinous substance called *taxin*. Two pounds of the leaves, according to Lucas, yield about 3 grains of taxin. This substance is but little soluble in water, but readily so in alcohol, ether, and dilute acids. The active properties of yew are probably due to the taxin and volatile oil, but on this point we have no positive evidence.

Medical Properties and Uses.—Yew leaves and fruits have been given for their emmenagogue, sedative, and antispasmodic effects. Pereira says that therapeutically the yew appears to hold an intermediate position between savin and digitalis, being allied to the former by its acrid, diuretic, and emmenagogue properties, and to the latter by the giddiness, irregular and depressed action of the heart, convulsions, and insensibility, which it produces. Yew is, however, reported to have one decided advantage over digitalis by its effects not accumulating in the system; so that it is a much more manageable remedy than it. Besides its use as an emmenagogue and sedative in the same cases as savin and digitalis are administered, it has also been employed as a lithic in calculous complaints; and as an antispasmodic in epilepsy and convulsions. According to Dr. Taylor, yew-tree tea is sometimes used by ignorant persons to cause abortion. At the present time, however, yew is never used in regular medical practice, the principal interest attached to it having reference to its poisonous properties. Thus the leaves and young branches act as a narcotico-acrid poison, both to the human subject and some other animals, but more especially to horses and cows. Fatal cases of poisoning have also occurred from swallowing the fruit. It is frequently stated that animals may feed upon the young growing

shoots with impunity, but that when these have been cut off, and left upon the ground for a short time, they are then poisonous. This is, however, an entirely erroneous notion, for yew shoots and leaves are poisonous both in a dried and fresh state. It seems certain, however, that the red succulent cup of the fruit is harmless, for a fatal case of poisoning has been recorded of a child from swallowing the entire fruit with its contained seed; whilst other children who had partaken of the fruit at the same time, but who had rejected all but the fleshy cup, suffered no ill effects.

Per. Mat. Med., vol. ii, pt. 1, p. 334; Lind., Flora Medica, p. 558; Bentl., Man. Bot., p. 646; Miller, Gard. Dict., vol. ii, pt. 2nd; Watts, Dict. Chem., vol. v, p. 702; Lancet, Oct. 17, 1868, p. 530; Pharm. Journ., vol. i, 2nd ser., p. 294, and vol. vi, p. 489.

DESCRIPTION OF PLATE.

Drawn from trees in Kew Gardens; the female flower copied from Nees.

1. Twig of male plant with catkins.
2. A catkin.
3. Vertical section of the same.
4. The same after the pollen is shed.
5. The connective.
6. An anther.
7. Small branch of female tree with fruit.
8. A female inflorescence.
9. The ovule.
10. Section of the same.
11. Half ripe fruit.
12. Ripe fruit.
13. Same with half the "aril" removed.
14. Section of seed.
15. Insertion of the leaves.

(2–6, 8–10, 14, 15 enlarged.)

D.Blair ad nat. del et lith.

M&N.Hanhart imp.

COCHLEARIA ARMORACIA, *Linn.*

N. Ord. CRUCIFERÆ. Lindl., Veg. K., p. 351 (*Brassicaceæ*); Le Maout & Dec., p. 221; Baill., Hist. Pl., iii.

Tribe *Alyssineæ*.

Genus Cochlearia,* *Linn.* B. & H., Gen., i, p. 75; Baill., Hist. Pl., iii, p. 270. Species about 30, natives chiefly of the colder parts of the northern hemisphere.

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21. Cochlearia Armoracia,† *Linn., Sp. Plant., ed.* 1, *p.* 648 (1753).

Horse-Radish.

Syn. — Cochlearia rusticana, *Lam.* Armoracia rusticana, *Baumg.* Roripa rusticana, *Gr. & Godr.*

Figures.—Woodville, t. 145; Hayne, v, t. 29; Steph. & Ch., t. 114; Nees, t. 400; Syme, E., Bot., i, t. 129; Reichenb., Ic. Fl. Germ., ii, t. 17.

Description.—A large herbaceous perennial with a short thick rootstock scarred by the fallen leaves, and a very long thick cylindrical root often more than an inch in diameter, nearly smooth, pale brownish-yellow externally, white or very pale yellow within, giving off thick horizontal branches at some distance below the surface of the ground which send up vertical stolons producing at their extremities new plants. Root-leaves very large, the blade reaching a foot long and the petiole of equal or greater length, oval- or ovate-oblong, usually subcordate and unequal at the base, obtuse at the apex, coarsely and irregularly crenate, thick, strongly veined, dark green. Stems 2 or 3 feet high, erect, stiff, smooth, striate, hollow, much branched in the upper part, branches weak, slender, ascending. Stem-leaves nearly or quite sessile, narrowly oval or strap-shaped, blunt, tapering below, serrate, smooth. Flowers numerous, $\frac{3}{8}$ inch wide, on long stalks arranged in numerous small axillary and terminal corymbs

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* *Cochlearia*, a mediæval name for the Scurvy-grass (*C. officinalis*), from the shape of the root-leaves, like a spoon, *cochlear*.

† *Armoracia*, the classical name; but it cannot be with certainty referred to the present plant, and may have been the name of the true Radish, *Raphanus sativus*, L.

lengthening out into racemes, the whole forming a large lax somewhat flat-topped inflorescence; no bracts. Sepals 4, equal, oval, smooth, blunt, somewhat spreading, purplish. Petals 4, alternate with the sepals and about twice their length, obovate-oblong, entire, usually with a short claw, white. Stamens 6, tetradynamous, filaments about as long as the sepals, anthers yellow. Ovary oblong, 2-celled, style short, stigma large capitate. Fruit (unripe) a small silicle about $\frac{1}{6}$ inch long, obovoid, somewhat inflated, pericarp thin, faintly veined, dehiscing into 2 boat-shaped valves without dorsal nerves. Seeds (not seen fully developed) several in each cell ovoid, smooth; cotyledons accumbent; no endosperm.

Habitat.—This large and coarse-looking plant is common enough in damp waste ground, river-banks and similar localities throughout this country and the whole of Europe except the most southern parts. It is, however, probably an introduced plant here and in Western Europe generally, its native country being found in Russia; though it can scarcely be said to be met with anywhere truly wild. Dr. Hooker suggests that it may be a cultivated form of the Hungarian *C. macrocarpa,* W. & K. It flowers in May and June. The seeds are very rarely perfected, though the pods sometimes grow apparently to their full size; but the plant is wonderfully persistent from the power which its long branching roots possess of producing adventitious buds, thus rendering it very difficult to extirpate. The root-leaves are frequently found deeply cut in a pinnatisect or bipinnatisect manner with oblong segments.

Hook, f., Stud. Fl., p. 34; Syme, E., Bot., i, p. 183; A. De Candolle, in Bot. Gazette, 1851, p. 141; Ledebour, Fl. Ross., i, p. 159; Lindl., Fl. Med., p. 91.

Official Part and Name.—Armoraciæ Radix; the fresh root (B. P.). The fresh roots (*Armoraciæ Radix, Horseradish Root*) (I. P.) It is not official in the Pharmacopœia of the United States.

General Characters and Composition.—Fresh horseradish root

is a foot or more in length; it is provided with a few irregularly arranged more or less thickened branches, and is either undivided above, or it divides into two or more divisions, from which the leaves, &c., arise. In diameter it varies from ½ an inch to 2 inches or more; but as commonly used it is about the thickness of the thumb or middle finger. In form it is enlarged at the crown, or point where the leaves are given off; it then slightly tapers, but soon becomes more or less cylindrical, and frequently maintains nearly the same thickness for some distance, and then commonly divides into two or more branches, or in some cases, very gradually tapers downwards. In colour externally it is pale yellowish- or brownish-whitish; and whitish and fleshy within. Its odour, when scraped or bruised, is highly pungent, frequently causing sneezing and a flow of tears; but when unbroken, it is almost inodorous. It has a very pungent taste, more especially in spring and autumn, accompanied by a bitterish or sweetish flavour according to the season in which it is collected, the manner in which it is cultivated, and the soil in which it is grown. If carefully dried its pungent taste is to a great extent retained; but it is gradually lost if the root be long kept.

We have given the above characters somewhat in detail in consequence of the deaths that have occurred from the poisonous Monkshood or Aconite root having been scraped and served up at table in the winter and early spring months in mistake for horseradish root. In a paper published by one of us in the *Pharmaceutical Journal* some years since, the distinctive characters of the two roots were tabulated as follows :—

Horseradish root.	*Aconite root.*
Form.—Slightly conical at the crown; then cylindrical or nearly so, and almost of the same thickness for many inches.	*Form.*—Conical, and tapering perceptibly and rapidly to a fine point.

Colour.—Pale yellowish- or brownish-white externally.	*Colour.*—Coffee-coloured, or more or less distinctly earthy-brown externally.
Odour.—Especially developed upon being scraped, when it is very pungent and irritating.	*Odour.*—Merely earthy.
Taste.—Very pungent, and bitter or sweet according to circumstances.	*Taste.*—At first slightly bitter, but afterwards producing a disagreeable tingling and numbness.

Since the publication of the above paper, and the marked attention which was called to this highly dangerous substitution, no further accidents have taken place; it is hoped, therefore, that now the great differences between the two roots have been pointed out it will not again occur.

The chemistry of horseradish root has not as yet been accurately determined. It is certain, however, that it owes its properties essentially to the formation of a *volatile oil* which may be obtained from it by distillation with water. This oil was proved by Hubatka, as far back as 1843, to be identical with the volatile oil obtained under like circumstances from black mustard seeds. The volatile oil does not therefore pre-exist in horseradish root, but is developed like that of black mustard from the mutual reaction of sinigrin and myrosin in the presence of water, as described under *Brassica* (*Sinapis*) *nigra*. This process, according to the authors of *Pharmacographia*, "does not go on in the growing root, perhaps because the two principles in question are not contained in the same cells, or else exist together in some condition that does not allow of their acting on each other,—a state of things analogous to that occurring in the leaves of *Lauro-cerasus*." It should, however, be noted that the presence of myrosin is inferred to be one of the constituents of horseradish root, rather than proved. The amount of volatile oil thus obtained by the distillation of fresh horseradish root with water is very small, averaging only about 0·2 per cent.

Medical Properties and Uses.—It has the same properties as

mustard, being stimulant, diuretic, and diaphoretic, when given internally; and rubefacient or even vesicant, when externally applied. When chewed it acts as a sialagogue; and when used in this way, or in the form of a syrup, slowly swallowed, it has been found useful in cases of hoarseness. As a general stimulant, diaphoretic, and diuretic, it has been employed in chronic rheumatism, scurvy, atonic dyspepsia, and dropsy. In the form of the official compound spirit of horseradish it is commonly used as a stimulating adjunct to other medicines, more especially to diuretic infusions. An infusion of horseradish has also been employed to excite vomiting; or to promote the operation of other emetics, as in poisoning by narcotic substances. Externally applied, it has been found useful in chronic rheumatism, paralysis, and other affections. As a medicine, however, it is but little employed; its chief use being as a condiment, and when partaken of in moderation, it increases the appetite, and promotes digestion. Its employment as a condiment in Northern and Central Europe has been known for centuries. Thus Gerarde, at about the end of the sixteenth century, speaks of its common use "among the Germanes to eat fish with, and such like meats, as we do mustard;" but it was not till about the middle of the seventeenth century that it began to be employed for similar purposes in this country.

Per. Mat. Med., by B. & R., p. 933; Pharmacographia, p. 66; Gerarde's Herball., by Johnson (1636), p. 240; U. S. Disp., by W. & B., p. 146; Hubatka, in Journ. de Pharm., 3rd ser., vol. xlii; Bentley, in Pharm. Journ., vol. xv, 1st ser., p. 449.

DESCRIPTION OF PLATE.

Drawn from a specimen collected by the Thames, near Kew Bridge, Surrey, flowering in June; the root from a plant in Kew Gardens; the fruit (not mature) from a Spanish specimen in the British Museum. 1. The inflorescence and upper part of flowering stem. 2. A flower. 3. Stamens and pistil. 4. A sepal. 5. A petal. 6. Immature fruit, natural size and enlarged. 7. A root-leaf. 8. Portion of the root. (2–5 enlarged.)

D.Blair ad nat. del. et lith.

M&N.Hanhart imp

TRIGONELLA FŒNUM-GRÆCUM. *Linn.*

N. Ord. LEGUMINOSÆ.

Tribe *Trifolieæ*.

Genus Trigonella,* *Linn.* B. & H., Gen., i, p. 486; Baill., Hist. Pl., ii, p. 290. Species about 50, chiefly inhabitants of S. Europe, N. Africa, and Asia Minor.

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71. Trigonella Fœnum-græcum,† *Linn., Sp. Plant., ed.* 1, *p.* 777 (1753).

Fenugreek.

Syn.—Fœnum-græcum officinale,

Figures.—Woodville, t. 154; Hayne, viii, t. 141; Nees, t. 325; Berg, Charact., t. 66, fig. 503; Flora Græca, t. 766.

Description.—An annual herb 1—2 feet high, with an erect, slightly branched, cylindrical, hollow, smooth or slightly pubescent stem; root tapering. Leaves alternate on rather long stalks, trifoliolate, stipules ¼ inch long, triangular-acuminate, entire, ciliate, leaflets shortly stalked, articulated to the rachis, oblong-obovate, blunt or emarginate at the apex, denticulate in the upper half, glabrous. Flowers sessile, solitary (rarely 2) in the axils of the leaves. Calyx long and narrow, divided about half way down into 5 narrowly lanceolate or linear acuminate teeth, hairy outside, pale green. Corolla papilionaceous, about twice as long as the calyx, pale yellow, standard about ¾ inch long, with a narrow claw and an ovate emarginate blade, wings much shorter, blunt, lower petals united in front to form a very blunt rounded keel shorter than the wings. Stamens 10, free from the corolla, hypogynous, the uppermost filament distinct, the other 9 combined except at their curved-up extremities, to form a sheath round the pistil, open above; anthers very small, similar. Ovary smooth or downy, with numerous ovules, style rather long, some-

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* *Trigonella*, from the triangular form of the flowers of *T. ruthenica*, L., the type of the genus.

† *Fœnum-græcum*, the name employed by Columella for this plant; in Greek, τῆλις and βούκερως.

what falcate, stigma capitate. Pod 5 to 7 inches long by $\frac{1}{6}$ to $\frac{1}{4}$ inch wide, erect when young, afterwards bent downwards, somewhat curved in a falcate manner, much laterally compressed, smooth, veined with a few longitudinal anastomosing nerves, surrounded at the base by the persistent calyx, gradually tapering at the apex into a long, slender beak, frequently capped by the withered corolla which has been carried on by the growth of the fruit. Seeds 10—20 in the pod, on long funicles, compressed, obliquely rhomboid, nearly $\frac{1}{4}$ inch long, pale orange, slightly rough, with a deep oblique furrow across the upper part; cotyledons plane-convex, radicle very large, doubled down on the edges of the cotyledons (accumbent); no endosperm.

Habitat.—A native of the East, including Thessaly, many parts of Asia Minor, and Persia. By cultivation it has spread through the Mediterranean region and Central Europe, and also into Egypt, Abyssinia, and India. It is now less used as a forage plant than formerly, but is still cultivated in the South of France, Morocco, Egypt, and India. The plant has a strong and characteristic smell, especially when dried.

If the seeds are placed in water, the inner seed-coat swells up into a thick mucilage and bursts the testa.

DC. Prod., ii, p. 182; Gren. & Godr., Fl. France, i, p. 397; Boissier, Fl. Orient., ii, p. 70; Oliver, Fl. Trop. Africa, ii, p. 70; Lindl., Fl. Med., p. 239.

Part Used and Name.—Fœni-Græci Semen; the seed. It is not official in the British Pharmacopœia, or the Pharmacopœia of India, or the Pharmacopœia of the United States. They were, however, formerly official in our pharmacopœias.

General Characters, Commerce, and Composition.—Fenugreek seeds of commerce are small, hard, angular, somewhat compressed, often more or less shrivelled, and with a light brown or brownish-yellow colour externally, and yellow internally. They have a somewhat oily and farinaceous taste, accompanied by a slight bitterness, and feeble melilot flavour; and a strong, peculiar odour, which is also suggestive of melilot, or of coumarin. They give

out the whole of their odour and taste to alcohol; and form when boiled with water a thick slimy mucilage.

The seeds are chiefly exported to Europe, from Egypt and India, where they are produced on a large scale. In Egypt, fenugreek is known by the Arabic name *Helbeh*, and in India under the Sanskrit name of *Methi*.

The principal constituents of the seeds are about 28 per cent. of *mucilage*, which is contained in the tissue investing the embryo; 6 per cent. of a slightly bitter fœtid *fatty oil*; a little *tannic acid*; and a *yellow colouring* matter. The seeds yielded to Jahns, from experiments performed in Dr. Flückiger's laboratory, 3·4 per cent. of nitrogen, equivalent to 22 per cent. of *albumin*. The nature of the odorous principle is unknown.

Medical Properties and Uses.—The use of fenugreek as a medicinal agent is now obsolete in Europe and the United States; but in India the seeds are largely employed by the natives, both as food and medicine; whilst the fresh plant is consumed as a vegetable. In Alexandria also the seedlings are eaten as a great delicacy.

Formerly the seeds were employed in the preparation of emollient cataplasms, fomentations, and enemata; but were never given internally. The powdered seeds are still used in this country and elsewhere in veterinary practice; as an ingredient of curry powder; and for flavouring, &c., the patent so-called concentrated Cattle Foods. They are also said to be employed to render damaged hay palatable.

Woodville's Med. Bot. (1793), vol. iii, p. 438; Miller's Gard. Dict., vol. ii, part 2; Gerarde's Herball., by Johnson (1636), p. 1196; Lindley & Moore's Treasury of Botany (1866), part 2, p. 1170; Pharmacographia, p. 150; Jackson, in Gardeners' Chronicle, July 29, 1876.

DESCRIPTION OF PLATE.

Drawn from a specimen in Kew Gardens, flowering in July. 1. Upper part of the plant. 2, 3. Standard. 4. Wing. 5. Keel of corolla. 6. Section of calyx and ovary. 7. Staminal sheath spread open. 8. Ripe pod. 9, 10. Seed. 11. Vertical, and—12. Transverse section of the same. 13. Embryo. (2–7, 11, 12 enlarged.)

D Blair, ad nat. del et lith.

M & N Hanhart

ROSA GALLICA. *Linn.*

N. Ord. Rosaceæ.

Tribe *Roseæ*.

Genus Rosa.

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104. Rosa gallica, *Linn., Sp. Plant., ed.* 1, *p.* 492 (1753).

French Rose. Provins Rose. Red Rose.

Syn.—R. pumila, *Linn. f.* R. austriaca, *Crantz.* R. cuprea, *Jacq.*

Figures.—Woodville, t. 179 (double fls.); Hayne, xi, t. 30; Steph. and Ch., t. 99 (double fls.); Jacq., Fl. Austr., t. 198.

Description.—A small rather compact erect bush, with numerous stems from a creeping rootstock and short stiff branches, the young shoots armed with short nearly equal straight prickles mixed with glandular setæ, but without any large hooked prickles. Leaves alternate, stalked, with rather large acute-pointed stipules adherent to the petiole, pinnate, with two pairs of opposite leaflets and a terminal one, leaflets shortly stalked or nearly sessile, oval or ovate, rounded at the base, acute at the apex, serrate, stiff, almost coriaceous, keeled, rugose with veins, pale and slightly pilose below, the leaf-serratures not edged with glands. Flowers large on long, setose, thick, upright, terminal and axillary stalks, with 2 or 3 more or less leafy bracts. Calyx with a fleshy dilated urn-shaped tube contracted at its mouth, and 5 spreading ovate acute imbricate divisions, with small leafy pinnæ on the outside margins, glandular-hairy externally, smooth within. Petals 5 (in the wild state), alternate with the segments of the calyx, broadly triangular-rounded, with a small claw, imbricate, spreading, veined, usually dark rich pink with claw pale. Stamens very numerous, inserted in several rows on the fleshy "disk" which lines the throat of the calyx, anthers short, flattened, 2-celled. Carpels numerous, inserted on the base and sides of the calyx-tube, ovaries with a single pendulous ovule, styles lateral, thickened upwards, projecting out of the mouth of the calyx-tube. Fruit composed of numerous 1-seeded indehiscent achenes inclosed in the swollen and fleshy calyx-tube which

is globose or ovoid, smooth, scarlet, and crowned with the persistent calyx-segments.

Habitat.—This species grows in a wild or semi-wild state throughout Europe, except the northern parts (which include the British Isles and Scandinavia), and extends to Greece, the Crimea, and Armenia. It has been in cultivation from a remote period, and there are very numerous double garden varieties of various shades of colour, which have not, however, the fragrance of *R. centifolia*. *R. pumila*, Linn. f., is generally recognised as the original wild form. For use, *R. gallica* is grown near Mitcham, in Surrey, and also in Oxfordshire and Derbyshire. The name Provins is taken from a small town so called in France, where in the middle ages a variety of this rose was grown which was greatly esteemed; at the present day it is extensively cultivated for use at places in Holland and near Paris. Probably *R. gallica* is not specifically distinct from *R. centifolia*.

Lindl., Monog. Ros., p. 68; Seringe, in DC. Prod., ii, p. 603; Boiss., Fl. Orient., ii, p. 676; Flück. & Hanb., Pharmacogr., p. 230; Lindl., Fl. Med., p. 228.

Official Part and Names.—Rosæ Gallicæ Petala; the fresh and dried unexpanded petals (B. P.). The dried petals (*Rosæ Gallicæ Flores*) of the unexpanded flowers (I. P.). Rosa gallica; the petals (U. S. P.).

Collection and Preparation.—Red Rose Petals are directed in the British Pharmacopœia to be collected from plants cultivated in Britain; and at Mitcham, where this plant is principally cultivated, and where it is incorrectly designated as the Damask Rose, the petals are thus collected and dried:—The flower-buds are gathered just before expansion, when they are about the size of a large nutmeg; the petals are then cut off near the base, leaving their whitish claws attached to the calyx. They are then carefully and rapidly dried by the heat of a stove; and when dried they are gently sifted to remove the stamens and other extraneous substances, and are then ready for the market. It is these dried petals of the unexpanded flowers

deprived of their whitish claws, which constitute the ordinary *red rose petals*, or *red rose leaves* as they are frequently called, of the pharmacies. The petals are collected before the flowers have expanded because they are then much more astringent than when obtained from the full-blown flowers; they are also dried rapidly because slow desiccation injures both their colour and astringency. It has been computed that 2000 flower-buds yield about 10 pounds of dried, or 100 pounds of fresh petals. The petals which are required for the official Confection of Roses are sent to the market in a fresh state.

General Characters and Composition.—As found in commerce, the dried petals are either more or less crumpled and separate, or loosely aggregated together in little cone-like masses. The petals have a rich velvety appearance, are crisp and dry, of a fine purplish-red colour, a fragrant roseate odour, which is principally developed by drying, and a bitterish, feebly acid, and astringent taste. As their colour and other characters are injured by exposure to light and air, they are best preserved in well-closed canisters, or in bottles protected from the light.

According to the investigations of late years, red rose petals contain traces of *tannic* and *gallic acids*, a little *fat, volatile oil, red colouring matter, quercitrin, glucose*, and *quercitannic acid*. The investigations of M. Filhol show that the astringency of red rose petals is more especially due to quercitrin, and not to tannic acid as was previously supposed. The properties of red rose petals are extracted by boiling water. The infusion thus prepared is of a pale red colour, but it becomes of an intense brilliant red or crimson on the addition of sulphuric acid, and also of other mineral and vegetable acids; and by alkalies it is changed to a bright green colour.

Medical Properties and Uses.—Red rose petals are slightly astringent and tonic. As these properties are, however, scarcely appreciable, they are chiefly employed on account of their colour, and in the form of one of their official preparations as an agreeable vehicle for the exhibition of other more active medicines.

Per. Mat. Med., vol. ii, pt. 2, p. 289; Pharmacographia, p. 231; U. S. Disp., by W. & B., p. 742; Garr., Mat. Med.. p. 250; Pharm. Journ., vol. x, 1st ser., p. 170; Filhol, in Journ. de Pharm., vol. xxxviii (1860), p. 21; Gmelin's Chemistry, vol. xvi (1864), p. 522.

DESCRIPTION OF PLATE.

Drawn from a plant in the Royal Gardens, Kew, flowering in July.

1. A flowering shoot.
2. Section of flower, the petals removed.
3. A petal.
4. A carpel.
5. Anthers.
6. A fruit.

(4 and 5 enlarged.)

D Blanc ad nat del et lith
M& N Hanhart imp

N. Ord. Oleaceæ. Lindl., Veg. K., p. 616; Le Maout & Dec., p. 545.

Tribe *Fraxineæ*.

Genus **Fraxinus**,* *Linn.* B. & H., Gen., ii, p. 676. Over 30 species are described, natives of the warm and temperate countries of the northern hemisphere.

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170. Fraxinus Ornus,† *Linn., Sp. Plant., ed.* 1, *p.* 1057 (1753).

Manna Ash. Flowering Ash. Meleos (Greece).

Syn.—Ornus europæa, *Pers.*

Figures.—Woodville, t. 209; Fl. Græca, t. 4, cop. in Steph. & Ch., t. 53; Nees, t. 374; Hayne, xiii, t. 11; Berg & Sch., t. 3 e.

Description.—A small tree, not usually growing above 15 or 20 feet high, with a slender stem and a smooth, grey bark, with the leaf-scars strongly marked on the young twigs. Leaves opposite, decussate, 2 pairs only being usually produced on each flowering branch, without stipules, 6—8 inches long, stalked, pinnate, with 4 pairs of leaflets and a terminal one, rachis smooth, channelled above, leaflets very shortly stalked, 1½—2 inches long, oblong-oval, the terminal one often somewhat obovate, tapering at both ends but especially to the acuminate apex, finely serrate, thin, glabrous on both sides, except at the sides of the midrib at the lower part of the under surface, where are patches of whitish wool, bright light green. Flowers bisexual, small, very numerous, appearing with the leaves, on long, very slender pedicels, in little bunches irregularly arranged on the opposite branches of pinnately divided panicles, the largest of which terminates the flowering branches, and four other smaller ones come from the axils of the two pair of leaves, the whole forming a very elegant, drooping, feathery, compound panicle. Calyx deeply divided into 4 narrowly triangular, acute, erect segments, smooth, persistent. Petals about $\frac{1}{6}$ inch in length, 5 times as long as the

* *Fraxinus*, the Latin classical name for the Ash; in Greek, μελία.

† *Ornus*, a classical name for a wild mountain ash; applied to this species by some mediæval writers.

calyx and alternate with its segments, strap-shaped, acute, wavy, widely spreading, creamy white, deciduous. Stamens 2, hypogynous, alternating with the petals, filaments when fully grown nearly as long as petals, spreading, white, anthers dorsifixed, apiculate, at first ovoid and pale, after dehiscence brown, linear and twisted. Ovary ovoid, compressed, smooth, tapering into the style, 2-celled, with two pendulous ovules in each cell; stigma with two large papillose lobes opposite the cells of the ovary. Fruit (a samara) abundantly produced, pendulous, dry, indehiscent, scarcely an inch long, and about $\frac{1}{6}$ inch wide, compressed, with a terminal, flat, obovate-linear blunt wing. Seed solitary, pendulous, occupying the whole fruit-cavity, the other three ovules abortive but remaining attached to the side of the ripe seed; embryo straight in the axis of the endosperm, radicle superior, long, cotyledons flat.

Habitat.—A native chiefly of South-eastern Europe and Asia Minor, and extending, in the Mediterranean region, westward to Corsica and Eastern Spain. From its graceful appearance it is also planted in most European countries as an ornamental tree, producing its abundant flowers in early summer. It was first introduced to England by Dr. Uvedale, of Enfield, about 1710, and is now frequently cultivated in gardens. The cultivation of the Manna Ash for commercial purposes is carried on in Sicily, where regular plantations have been formed.

There is great variation in the form of the leaflets, and it is not unfrequent to find each one of the basal pair split up into two. *Fraxinus rotundifolia*, Lam., the leaves of which are figured in Hayne xiii, t. 12, from specimens in the St. Petersburg Herbarium, appears to be a form with more rounded leaves (or perhaps a young state), and not to constitute a distinct species.

Bertolini, Fl. Ital., i, p. 52; Boissier, Fl. Orient., iv, p. 39; DC. Prod., viii, p. 274; Hanbury, in Pharm. Journ., 1870, p. 326.

Official Part and Name.—MANNA; a concrete saccharine exudation from the stem of Fraxinus Ornus, *Linn.* and Fraxinus rotundifolia, *DC.* obtained by making incisions in the stems of

the trees, which are cultivated for the purpose (B. P.). A concrete saccharine exudation from the stem, obtained by incisions (I. P.). MANNA; the concrete saccharine exudation, in flakes, of Fraxinus Ornus, and of Fraxinus rotundifolia (U. S. P.).

Extraction, Collection, and Commerce.—Manna was formerly obtained, as stated in the British and other pharmacopœias, from Sicily and Calabria, but the manna of commerce, as ascertained by Hanbury, is now exclusively collected in Sicily. For this purpose the trees are cultivated in plantations called *frassinetti*. When a tree is about 8 years old, and its stem not less than 3 inches in diameter, it is usually found to be in a sufficient state of maturity for the collection of manna. The stem generally continues to yield manna for 10 or 12 years, when it is cut down, and its place is ultimately taken by one or more shoots from the stump.

To obtain manna, transverse incisions from about 1½ to 2 inches in length and 1 inch apart, are made in the bark so as just to reach the wood, by means of a hooked or curved knife. One transverse cut is first made at the lower end of the tree near the ground, and a corresponding incision is made directly above this on the succeeding day, and this operation is repeated daily in warm weather, as long as the dry weather lasts, for dry and warm weather are necessary for a good harvest. In the following year similar incisions are made in a part of the stem which was untouched the previous year; and a similar operation is repeated in succeeding years, until the tree has been incised all round and is exhausted, when it is cut down as before noticed. The best time for making incisions into the trees is about July or August, at which period they have ceased to produce more leaves. From the incisions thus made in the stems manna exudes as a clear liquid which soon concretes on the stem, or on other substances placed for that purpose in the incisions. Hanbury says, that "Pieces of stick or straws are inserted in the incisions, and become encrusted with the very superior manna called *Manna a cannolo*, which, however, is unknown in commerce as a special sort. The fine manna ordinarily seen appears to have hardened on the stem of

the tree." According to Houel, flake manna is obtained during the height of the season, at which period the juice flows vigorously; and Stettner states that it is procured from the upper incisions, the juice being there less fatty than that in the lower part, and that consequently, it more easily dries in tubes and flat pieces. In the lowermost incisions small leaves of the ash are inserted to conduct the juice into a receptacle formed by a cup-shaped piece of the stem of the prickly pear (*Opuntia*), or on to tiles; this manna is more gummy and sticky, and less crystalline, and is of inferior quality. Some manna also of inferior quality is scraped off the stem after the finer flaky pieces have been gathered. After the manna has been removed from the tree, it is placed upon shelves to dry, and then packed for the market. In 1872 about 3500 cwt. of manna was exported from Sicily. It is commonly packed in deal boxes, having partitions, and frequently lined with tin plate.

General Characters, Varieties, and Composition.—Several kinds of manna have been described by pharmacologists, but only two are now commonly distinguished in this country; these are known as *Flake Manna*, and *Small Manna* or *Tolfa Manna*. Flake manna is the finest kind, and is alone official. It occurs in pieces which vary from 1 to 6 or even 8 inches in length, from 1 to 2 inches in width, and from ½ to 1 inch in thickness. Their form is more or less stalactitic, owing to the slow exudation of the juice and the deposition of successive layers over one another. The pieces are commonly flattened or somewhat grooved on the side where they have adhered to the tree or substance upon which they have concreted, and on this side they are also generally soiled. They have a pale brownish-yellow colour on their inner surface, but are nearly white on their outer parts. Good Flake Manna is crisp, brittle, porous, and crystalline in structure, and readily soluble in about six parts of water; it has a faint odour resembling honey, and a honey-like taste, combined with a very slight acridity and bitterness. The smaller inferior pieces of manna are termed *Small Manna* or *Tolfa Manna*.

The principal constituent of manna is *Mannite* or *Manna-sugar*,

the quantity of which in the best varieties varies from 70 to 80 per cent., but the inferior sorts sometimes only contain about 60 per cent. A kind of sugar (*dextro-glucose*) is also present in manna, sometimes to the extent of 16 per cent., the fatty inferior mannas having the most. Manna likewise contains a very small quantity of a *red brown resin* with a sub-acrid taste and very unpleasant odour; and a faintly astringent, bitter, crystalline substance, called *fraxin*, which closely resembles *Æsculin*, and to the presence of which the fluorescence of an alcoholic solution of manna is due, as well as the greenish colour of some pieces of manna. The laxative constituent has been ascribed to extractive matter, and to the resin, but mannite possesses in itself similar properties to manna, and it is therefore doubtless to this that the medicinal property of manna is essentially, if not entirely, due.

Medical Properties and Uses.—Manna is a mild laxative. It is especially suitable for children and delicate persons; and also as an adjunct to more active aperients, in order to assist their action, and to disguise their disagreeable taste. Manna is, however, far less used in this country than formerly. Mannite possesses similar laxative properties to that of manna, and is frequently employed on this account in Italy.

Per. Mat. Med., vol. ii, part 1, p. 671; U. S. Disp., by W. & B., p. 547; Pharmacographia, p. 366; Hanbury, in Pharm. Journ., vol. xi, 2nd ser., p. 326, and vol. iii, 3rd ser., p. 421; Stettner, in Archiv der Pharm., vol. iii, p. 194; Pharm. Journ., vol. ix, 1st ser., p. 283; Hooker's Journ. of Bot., vol. i, p. 124; Cleghorn, in Trans. Bot. Soc. of Edin., vol. x (1868-69), p. 132; Buignet, in Journ. de Pharm., vol. vii (1867), p. 401, and vol. viii (1868), pp. 5–16.

DESCRIPTION OF PLATE.

Drawn from a specimen in Kew Gardens; the fruit from an oriental specimen in the British Museum. 1. A flowering branch. 2. A fully expanded flower. 3. Unopened anthers. 4 and 5. The calyx and pistil. 6. Vertical, and—7. Transverse section of the same. 8. Fruit. 9. Vertical section of the same and of the seed. 10. Fruit with a part of the pericarp removed, showing the ripe seed and the aborted ovules. 11. Transverse section of seed. (2–7, 10, 11 enlarged.)

D Blair ad nat. del. et lith.

M&N Hanhart

THYMUS VULGARIS, *Linn.*

N. Ord. LABIATÆ.

Tribe *Satureieæ*.

Genus Thymus,* *Linn.* B. & H., Gen., ii, p. 1186. Species variously estimated at 50 to 80, nearly all inhabitants of the Mediterranean region.

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205. Thymus vulgaris, *Linn., Sp. Plant., ed.* 1, *p.* 591 (1753).

Garden Thyme. Thyme.

Figures.—Woodville, t. 125; Nees, t. 182; Hayne, xi, t. 2; Berg & Sch., t. 18 e.

Description.—A small, much-branched shrub, scarcely a foot high, the branches ascending, opposite, slender, very bluntly quadrangular, with a pale brown bark, the young shoots purplish-red, pubescent with very short stiff white hairs. Leaves opposite, sessile, $\frac{1}{4}$—$\frac{3}{8}$ inch long, oval or oval-lanceolate, blunt, entire with the margin revolute, thick, smooth, dotted with numerous oil-glands, paler beneath. Flowers polygamous, numerous, on slender stalks arranged in small shortly stalked cymes in the axils of the uppermost leaves and forming terminal rounded capitate heads, often with a few whorls below. Calyx bilabiate, hairy externally, dotted with glands, the upper lip flat of three very short triangular teeth, the lower of two stiff curved subulate teeth about as long as the tube, which has a ring of dense white hair at its mouth within. Corolla small, the tube not much exceeding the calyx, cylindrical, smooth within, the limb nearly flat, spreading, the upper lip emarginate, the lower with 3 blunt rounded lobes, faintly veined. Stamens 4 inserted in the tube of the corolla, with very short equal filaments and small rounded anthers in the female flowers, in the bisexual flowers with long exserted filaments and the two lateral much the longest; anthers kidney-shaped with a wide connective, violet-coloured. Style exserted, longer in the female than in the bisexual

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* *Thymus, θύμος*, the classical name.

flowers, bifid. Achenes elevated on a gynophore, perfectly smooth, brown.

Habitat.—This aromatic fragrant plant grows abundantly in stony places in the Mediterranean countries of Europe from Portugal to Greece, including Corsica and the Balearic Islands, but it does not reach the African coast or extend into Asia Minor.

It is much grown in English kitchen-gardens where it reaches a larger size than in its wild localities; but it is very variable in this respect and in the amount of grey tomentum and arrangement of the verticils of flowers; resembling in this respect the common wild thyme of this country, *T. Serpyllum*, L., to which it is closely allied.

Benth., in DC. Prod., xii, p. 199; Gren. & Godr., Fl. France, ii, p. 657; Willk. & Lange, Prod. Fl. Hispan., ii, p. 403.

Official Part and Name.—Oleum Thymi; the volatile oil obtained from Thymus vulgaris (U. S. P.). It is not official in either the British Pharmacopœia, or the Pharmacopœia of India.

Production, General Characters, and Composition. — Oil of Thyme is derived solely from the South of France. In the neighbourhood of Nismes, according to Hanbury, who visited this district in 1849, the oil is obtained in large quantities by submitting the whole plant to distillation with water. It is distilled at two periods of the year, namely, when the plant is in flower in May and June, and again, late in the autumn. The oil after the first distillation is of a deep reddish-brown colour, and is called *Huile rouge de Thym;* but when re-distilled it becomes colourless, and is then termed *Huile blanche de Thym.* The latter oil is also somewhat less fragrant than the former. Both kinds of oil are purchased by the merchants in the neighbouring towns, and thence exported to other parts. The red oil is that more commonly met with in commerce, and according to Wood and Bache, it is the only kind found in the shops in the United States. This oil is also, as first proved by Hanbury, commonly known as *Oil of Origanum.* The latter oil is, however, very distinct in its characters, and is not found in commerce.

Oil of Thyme consists of a fluid portion, which is a mixture of

two hydrocarbons, termed *Cymene* and *Thymene;* and of a solid crystalline oxidized substance with a strong aromatic odour somewhat resembling that of the crude oil, and a very burning taste, called *Thymol.* Thymol is isomeric with the carvol of oil of caraway, as is noticed in our description of that oil.

Medical Properties and Uses.—Oil of thyme is a useful and powerful local stimulant, and may be applied to a carious tooth by means of lint or cotton to relieve toothache; or when mixed with olive oil or spirit, especially if combined with camphor, as a stimulating liniment in chronic rheumatism, sprains, bruises, &c. The chief consumption of oil of thyme is, however, in veterinary practice. Oil of Thyme is also used for scenting soaps.

Thymol, or Thymic acid as it has been also termed, has been recommended as a disinfectant in the place of carbolic acid, the properties of which it is said to possess, but without its disagreeable smell. It has been highly recommended by Dr. Paquet, Professor of Clinical Surgery at Lisle, who states that it is adapted for all those purposes to which carbolic acid has been applied as a disinfectant.

The herb generally has similar aromatic properties to marjoram, sage, and many other labiate plants, but it is not employed medicinally in this country, although it is often so used on the Continent. In the United States, it is occasionally employed with other aromatic herbs in baths, cataplasms, and fomentations.

The herb is largely used by the cook as a flavouring agent.

Per. Mat. Med., vol. ii, pt. 1, p. 517; Pharmacographia, p. 437; U. S. Disp., by W. & B., p. 621; Gmelin's Chemistry, vol. xiv (1860), pp. 183, 311, and 409; Watts, Dict. Chem., vol. v, p. 793; Hanbury, in Pharm. Journ., vol. x, 1st ser., pp. 6 and 324; Journ. de Pharm. (1868), p. 147.

DESCRIPTION OF PLATE.

Drawn from a plant in the Royal Gardens, Kew, in flower in July. 1. A branch with numerous twigs and flower-heads. 2. A leaf. 3. A female flower. 4. Corolla laid open. 5. Calyx seen from below. 6. Section of calyx. (2–6 enlarged.)

D.Blair ad nat. del. et lith.

M&N.Hanhart imp.

DAPHNE MEZEREUM, *Linn.*

N. Ord. THYMELACEÆ. Lindl., Veg. K., p. 530; Le Maout & Dec., p. 656; Baill., Hist. Pl., vi.

Genus Daphne,* *Linn.* Baill., Hist. Pl., vi, p. 133. Species about 40, natives of the northern half of the old world.

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225. Daphne Mezereum,† *Linn., Sp. Plant., ed.* 1, *p.* 356 (1753).

Mezereon.

Syn.—Mezereum officinarum, *C. A. Meyer.*

Figures.—Woodville, t. 245; Hayne, iii, t. 43; Steph. & Ch., t. 65; Nees, t. 125; Berg & Sch., t. 126; Syme, E., Bot., viii, t. 1246; Reichenb., Ic. Fl., Germ., xi, t. 556; Nees, Gen. Fl. Germ.; Baill., l. c., figs. 81–85.

Description.—A small, slender, straggling shrub, from 1 to 4 feet in height, with an erect stem and few ascending branches covered with very smooth, silvery-grey bark and terminated by large buds, the young branchlets with a fine white tomentum; the bark becomes darker coloured on the root. Leaves deciduous, alternate, nearly sessile, spreading, 2—3 inches long, lanceolate, rather blunt, entire, smooth, dark green. Flowers in small clusters of 2 or 3, sessile on the branches of the previous year and produced from buds in the axils of the fallen leaves; a few small, ovate, smooth bracts at the base of the flowers. Perianth gamophyllous, tubular below, limb nearly ½ inch wide, spreading, deeply cleft into 4 ovate, acute or bluntish, imbricate segments, purplish-pink, darker and more red on the outside, tube finely hairy externally, smooth within. Stamens 8, inserted in two alternating rows just within the throat of the perianth-tube, filaments very short, anthers small, 2-celled, yellow. Ovary ovoid, tapering at both ends, about half as long as the perianth-tube within which it is quite enclosed though entirely free from it, one-celled, with a single pendulous anatropous ovule, style very short, stigma capitate. Fruit fleshy, ovoid, about ⅜ inch long, slightly pointed,

* The classical δάφνη, sacred to Apollo, is *Laurus nobilis*, L.; the name was given to this genus from the laurel-like foliage of some species.

† *Mezereum*, a mediæval name, altered from the Persian *Mazariyun*, which was applied to a species of *Daphne*.

sessile, bright red, pulp (epicarp) succulent, lined by a thin green skin (endocarp ?) closely surrounding the seed, and traversed by the orange-coloured raphe. Seed solitary, circular on section, but tapering at each end to a point, with a broad, shallow groove along one side, testa shining, dark purple brown, paler inside; inner coat very thin, yellow. Embryo large, spherical, with large plane-convex cotyledons, and a small exserted radicle; no endosperm.

Habitat.—The mezereon grows in hilly woods, ascending into sub-alpine districts throughout Europe, and is especially frequent in the central and eastern parts; in the west it is more scarce, and in England is decidedly rare, being met with chiefly in woods on chalk or limestone in the southern counties; in many of its localities it is considered to be an escape from gardens. The shrub reaches the arctic regions and extends eastward into Siberia.

The flowers are very fragrant and appear in March when the leaf-buds are just commencing to expand; they persist for some time and are succeeded by the handsome scarlet fruit which is ripe in July. By this time the terminal buds have developed into long shoots, and the "berries" appear placed some distance down the stem though the flowers were near its extremity; the crimson-coloured flower buds for the subsequent year are already present in or rather a little above the axils of the new leaves. There are varieties with white flowers and with yellow fruit.

By some authors the fruit is described as a drupe, the hard covering of the seed, above called the testa, being regarded as a stone or putamen.

Hook., f., Stud. Fl., p. 322; Syme, E., Bot., viii, p. 84; Watson, Comp. Cyb. Br., p. 305; Meisner, in DC. Prod., xiv, p. 530; Lindl., Fl. Med., p. 324; Ledebour, Fl. Ross., iii, p. 546.

Official Part and Names.—Mezerei Cortex; the dried bark of Daphne Mezereum, *Linn.* or of Daphne Laureola, *Linn.* (B.P.). The dried bark (*Mezereon Bark*) of the above plants (I. P.). Mezereum; the bark of Daphne Mezereum, and of Daphne Gnidium (U. S. P.).

In the London and Edinburgh Pharmacopœias, the only official Mezereon Bark before the issue of the British Pharmacopœia in

1864, was the root-bark of *Daphne Mezereum*. The stem-bark is usually regarded as somewhat less active than the root-bark, but in the Dublin Pharmacopœia, formerly, and in the United States and most of the Continental pharmacopœias, the bark of both root and stem was included under the common name of Mezereon; and now, in consequence of the impossibility of obtaining a sufficient supply of the root-bark, the bark of both root and stem is also made official in the British Pharmacopœia, and in the Pharmacopœia of India. The British Pharmacopœia now also allows the bark of *Daphne Laureola* to be used as well as that derived from *D. Mezereum*; and the Pharmacopœia of the United States likewise permits the bark of *Daphne Gnidium* to be employed indiscriminately with that of *D. Mezereum*. We shall subsequently figure and describe both *Daphne Laureola* and *D. Gnidium*.

Collection and Commerce.—Mezereon bark, or Mezereon as it is simply termed in the Pharmacopœia of the United States, is collected in the winter months, and after being dried, it is made up into rolls or bundles. Formerly it was collected for medicinal purposes in Kent and Hampshire; but at present it is mostly imported from Germany.

General Characters and Composition.—Mezereon bark occurs in more or less flattened strips and quilled pieces of various lengths; but rarely more than about $\frac{1}{20}$ of an inch thick. It is covered externally by an olive- or somewhat reddish-brown, corky, and readily separable layer; and is white, very tough, fibrous, and cottony, internally. The stem-bark is readily recognised from the root-bark, more especially when fresh, by the green colour of its cellular envelope or part beneath the outer corky layer. The bark of the younger branches is also marked by evident leaf-scars. When chewed, the taste of the root-bark is at first sweetish, but afterwards persistently burning and acrid; that of the stem-bark is somewhat less acrid. When fresh mezereon bark has an unpleasant odour, but this is nearly lost in the dried state.

Mezereon bark is said to owe its acridity to a *resin*, but this substance has never been thoroughly examined. According to

Squire, mezereon bark also contains an *acrid volatile oil.* He says, "the pungent odour given off by boiling mezereon root in water over a lamp is so powerful, that, after holding my head over it for a short time, great irritation was produced, and it was difficult to carry on respiration." A neutral non-volatile glucoside, which appears to be destitute of active properties, is another constituent of the bark; it has been termed *daphnin.*

Medical Properties and Uses.—Locally applied in a moistened state to the skin, mezereon bark will produce redness and even vesication, but its action is slow, generally requiring from twenty-four to forty-eight hours to raise a blister. It is, however, sometimes used in France as a vesicatory, as follows :—The bark is first softened by soaking it in hot vinegar and water, and then applied to the part by a compress and bandage; and the application renewed night and morning until vesication is produced. An ointment of the bark is likewise used to keep issues or blisters open. It is this rubefacient and vesicant property which has led to the introduction of an ethereal extract of the bark as an ingredient in the official compound liniment of mustard. As an internal remedy, it is stimulant, diaphoretic, and diuretic; in large doses it acts as an irritant, causing vomiting and purging. It has been given in chronic rheumatism, and in syphilitic, scrofulous, and cutaneous affections, but with doubtful results. It is but rarely given in this country except as an ingredient in the compound decoction of sarsaparilla.

Per. Mat. Med., vol. ii, pt. 1, p. 477; Per. Mat. Med., by B. & R., p. 566; Pharmacographia, p. 486; U. S. Disp., by W. & B., p. 560; Squire, in Pharm. Journ., vol. i, 1st ser., p. 395: Zwenger, in Annal. der Chem. und Pharm., vol. cxv, p. 1.

DESCRIPTION OF PLATE.

The flowering branch drawn from a specimen collected at High Wycombe, Bucks, by Mr. Hiern, flowering in March; the leaves and fruit from a plant in Chelsea Gardens. 1. A branch with flowers and leaf-buds. 2. A branch with fruit and developed leaves. 3. Vertical section of a flower. 4. Vertical section of ovary. 5. Fruit with half the pulp removed. 6. The same with the whole of the pulp removed. 7. A seed. 8. Vertical, and—9. Transverse section of the same. (3-9 enlarged.)

D.Blair ad.nat del.et lith.

M&N.Hanhart imp

PINUS SYLVESTRIS, *Linn.*

N. Ord. CONIFERÆ.
Tribe *Pineæ*.
Genus Pinus, *Linn.*

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257. Pinus sylvestris, *Linn., Sp. Plant., ed.* 1, *p.* 1000 (1753).

Scotch Fir.

Figures.—Woodville, t. 1; Steph. & Ch., t. 73; Nees, t. 80; Berg and Sch., t. 8 d; Hayne, xiv, t. 9; Syme, E., Bot., viii, t. 1380; Reichenb., Ic. Fl. Germ., xi, t. 521; Lambert, Pinus, t. 1; Nees, Gen. Fl. Germ.; Richard, Comm. de Conif., t. 11.

Description.—A tall tree reaching under favorable conditions 70 or 80 feet in height, with a rounded or rather flat spreading somewhat dense head ; trunk rather slender, usually simple, rarely reaching 10 or 12 feet in circumference, branches numerous, irregular, spreading, tortuous, bark reddish-grey, deeply fissured, breaking off in flaky pieces. Leaves in twos, the fascicle surrounded at the base by a sheath of scales which become torn and fimbriated, evergreen, 2—3 inches long, linear-subulate, stiff, sharply pointed, minutely serrulate on the margin, channelled above, convex beneath, slightly glaucous, smooth. Male catkins small, about $\frac{1}{6}$ inch long, ovoid, shortly stalked, with a few papery, orange-coloured bracts at the base, crowded upon the lower part of a young branch which is terminated by a leaf-bud afterwards growing out into a shoot ; anthers numerous in each catkin, very shortly stalked, closely placed on the slender axis, 2-celled, cells placed on the lower surface of the connective which is slightly prolonged beyond them into a membranous tongue, dehiscing by wide longitudinal openings, pollen-grains bright yellow, globose with two protrusions, giving the appearance of being in threes. Female cones usually 2 or 3 together, each terminating a young shoot, and surrounded at the base by scales and whorls of young leaf-fascicles in their sheaths, roundish-ovoid, about $\frac{1}{4}$ inch long, at first erect; bracts membranous, roundish, deciduous, carpellary scales exceeding the bracts, fleshy, thick-

ened at the end, and provided at the top with a projecting point; ovules 2, inverse, bottle-shaped, placed obliquely on the base of the scale, the open mouths with longish teeth. Ripe cones shortly stalked, usually solitary, reflexed, ovoid-conical before opening, 1—1½ inches long, brownish ash-coloured, scales not numerous, woody, linear-oblong, imbricated, the ends much thickened, their exposed part (apophysis) oblique, rhomboidal, with a transverse ridge and central tubercle, the lower ones shorter and empty, the upper ultimately widely separating and spreading. Seeds over half an inch long, the membranous wing occupying over ¾ of the length, testa woody, embryo polycotyledonous in the axis of somewhat fleshy endosperm.

Habitat.—The Scotch Fir forms vast woods in many parts of Northern Europe and Asia, extending into the arctic regions; it is also a native of the Central European chains, reaching up to 6000 feet in the Alps and Pyrenees, and its range extends into the Caucasus, Armenia, and Cappadocia. In Britain there is no doubt it was at one time common, but it is now only met with in the native state in a few of the Highland forests of Scotland; it is, however, extensively planted in heathy and sandy districts, and has become semi-naturalised in such localities.

The cone takes two years to ripen, and undergoes considerable changes in form and colour during that period.

Hook. f., Stud. Fl., p. 348; Syme, E., Bot., viii, p. 264; Watson, Comp. Cyb. Br., p. 319; Parlatore, in DC. Prod., xvi, 2, p. 560; Lindl., Fl. Med., p. 553.

Official Parts and Names.—Pix Liquida, *Tar;* a bituminous fluid obtained from the wood of Pinus sylvestris, *Linn.* and other pines by destructive distillation (B. P.). A bituminous liquid (*Liquid or Wood Tar*), obtained by destructive distillation (I. P.). Pix Liquida; the impure turpentine from the wood of Pinus palustris, and of other species of Pinus, procured by burning (U. S. P.).

Preparation and Commerce.—The official pine-wood tar is procured by the destructive distillation of fir timber in the northern parts of Europe, and in America, and is known in commerce as *Archangel tar*, *Stockholm tar*, and *American tar*. The great bulk of that used in Europe and known as Archangel or Stockholm tar, is prepared in Finland, Sweden, and Northern and Central Russia, and is procured to a large extent from Pinus sylvestris, *Linn.;* that used in America is said to be chiefly obtained from Pinus palustris, *Mill.* (Pinus australis, *Mich.*). The tar obtained in Europe is generally considered to be superior to American tar.

The process now usually followed for obtaining tar is essentially the same as that practised by the Macedonians, and described by Theophrastus. It is a kind of downward distillation of the roots and lower portions of the trunks of the old pines; the more valuable parts of the trees being used as timber. The process as carried on in Bothnia has been thus described by Dr. Clarke:—The situation most favourable to the process is in a forest near to a marsh or bog, because the roots of the fir, from which tar is principally extracted, are always most productive in such places. A conical cavity is first made in the ground (generally in the side of a bank or sloping hill); and the roots of the fir, together with logs and billets of the same, being neatly trussed in a stack of the same conical shape, are let into this cavity. To prevent the volatile parts from being dissipated, the whole is then covered by turf, which, by means of a heavy wooden mallet and wooden stamper, worked separately by two men, is beaten down, and rendered as firm as possible about the wood. The stack of billets is then kindled, and a slow combustion of the fir takes place, without flame, as in making charcoal. During this combustion the tar exudes, and a cast-iron pan being at the bottom of the funnel, with a spout which projects through the side of the bank, barrels are placed beneath this spout to collect the fluid as it comes away. As fast as the barrels are filled, they are bunged and ready for immediate exportation. The time required for this slow combustion varies according

to circumstances (more especially from the size of the stacks), from one to four weeks; and the amount of tar thus obtained by this rude process is from 7 to 8 per cent. An improved and more rapid method for obtaining tar by distillation in properly constructed stills, has recently been introduced into Russia, by which more than twice this amount of tar can be obtained.

The amount of tar imported into Great Britain in 1872 was 189,291 barrels, of which 145,483 barrels were shipped from Russian ports. A barrel usually contains about 30 gallons.

General Characters and Composition.—Tar is a viscid, semi-liquid, brownish-black substance, with a peculiar aromatic odour. Its viscidity is, however, destroyed by heat. When examined by a magnifying lens, colourless crystals of *Pyrocatechin* may be commonly observed in tar, although in some varieties they cannot be detected. Tar is soluble in alcohol, ether, or chloroform, and in the fixed and volatile oils. Water agitated with it acquires a pale brown colour, sharp empyreumatic taste, and acid reaction. This acid reaction is due to the presence of pyroligneous acid. The vapour of tar is highly inflammable.

Tar is a very complex substance; but consists principally of *empyreumatic resin, acetic acid,* various *liquid hydrocarbons, resin,* and *oil of turpentine.*

Medical Properties and Uses.—Tar acts both locally, and internally, as a stimulant. It is also regarded as diuretic, and diaphoretic. Externally in the form of tar ointment or tar water, it has a well-established reputation in some chronic skin diseases, as eczema, psoriasis, lepra, ringworm, and others. Tar ointment has also been found a useful application to foul and indolent ulcers. Tar has likewise been employed successfully as an internal remedy in chronic bronchitis, typhoid fever, and habitual constipation. The vapour from heated tar has been also advantageously used in phthisis, chronic bronchitis, and other pulmonary affections. Tar is also much employed in veterinary practice, in the treatment of thrush in the horse; foot-rot in sheep; and various skin affections, &c.

But a very small quantity of tar is, however, used in medicine.

Its chief consumption is in ship-building, and for the preservation of fences, &c.

Other Products of Pinus sylvestris.—Besides the official tar as above described, several other substances are also obtained from this tree. Thus oil of turpentine is an important product; this is described under *Pinus australis* and *Pinus Tæda*.

Pitch, Black Pitch, or *Pix arida,* which was formerly official in our pharmacopœias, is another valuable product. It is obtained by submitting tar to distillation, when the residuum left in the still is pitch. At ordinary temperatures, pitch is an opaque, black, solid substance, breaking with a shining conchoidal fracture. It softens by the heat of the hand, and is readily soluble in alcohol and the other liquids already mentioned as solvents of tar. It has very little taste, but a disagreeable odour. Pitch consists of resin, combined with various other empyreumatic resinous substances which are commonly known under the name of *pyretin.* Pitch is very largely imported into this country from Russia, and also to some extent from other tar-producing countries; it is also manufactured here from tar. The chief consumption of pitch is for similar purposes as tar, but it is also occasionally used like it in medicine. Thus externally in the form of an ointment, as an application to obstinate skin diseases, and to foul and indolent ulcers; but tar is generally preferred in such cases. It has likewise been recommended as an internal remedy in skin diseases and in piles. It is also used in veterinary practice, more especially as a mild stimulant application in thrush and canker in horses; and foot-rot in sheep.

Pinus sylvestris also yields the valuable timber known as Dantzic or Riga Fir, and Russian Deal. The inner bark is likewise used in Norway for making Bark Bread. From the leaves of this species of Pinus the substance called Pine-wool or Fir-wool is also chiefly prepared. This wool is used for stuffing mattresses, &c., and is said to be repulsive to vermin. Wadding for medical use, and cloth for numerous articles of dress, &c., are also manufactured from these leaves. An oily substance called fir-wool oil or fir-wool spirit has also been introduced into this country from

Germany, and recommended for external use in rheumatism, neuralgia, &c. Paper of good quality is now also manufactured from the wood of this and some other species of *Pinus* and *Abies*.

Per. Mat. Med., vol. ii, pt. 1, p. 321; Pharmacographia, pp. 560 and 564; Steph. & Church., Med. Bot., by Burnett, vol. ii, pl. 73; U. S. Disp., by W. & B., p. 679; Garr., Mat. Med., p. 368; Tuson's Veterinary Pharmacopœia, p. 199; Bentl., Man. Bot., p. 645; Watts, Dict. Chem., vol. v, p. 669.

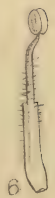
DESCRIPTION OF PLATE.

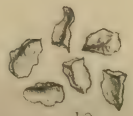
Drawn from a specimen in the Royal Gardens, Kew.

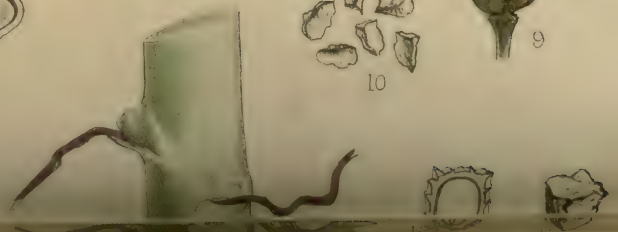
1. A branch with male and female flowers, and an immature and ripe fruit.
2. A female cone.
3. Vertical section of the same.
4. Under, and—5. Upper surface of a carpellary scale.
6. A male catkin.
7. A stamen seen from below and from the side.
8. A scale of ripe fruit showing the two seeds *in situ*.
9. Lower surface of the same.
10. Section of seed.

(2–7 and 10 enlarged.)

6. 草烏頭







D.Blair, ad nat. del. et lith.

M&N.Hanhart imp

ACONITUM NAPELLUS, *Linn.*

N. Ord. RANUNCULACEÆ.

Tribe *Helleboreæ*.

Genus Aconitum,* *Linn.* B. & H., Gen., i, p. 9; Baill., Hist. Pl., i, p. 23. Species about 20, inhabitants of temperate and montane districts in both the old and new worlds.

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6. Aconitum Napellus,† *Linn., Sp. Plant., ed.* 1, *p.* 532 (1753).

Monkshood. Wolfsbane. Aconite.

Syn.—A. vulgare, *DC.* A. tauricum, *Jacq.* A. angustifolium, *Bernh.* A. multifidum, *Koch.* A. dissectum, *Don.* A. ferox, *Wall., in Pl. Asiat. rar.* (*not elsewhere*).

Figures.—Woodville, t. 165; Steph. & Ch., t. 28; Nees, t. 395, & Supp.; Hayne, xii, tt. 12–14; Berg & Sch., t. 28 f; Syme, E. Bot., i, t. 48; Reich., Ic. Fl. Germ., iv, t. 92; Wallich, Pl. Asiat. rar., t. 41.

Description.—An herbaceous perennial with a short fleshy rootstock or tuber tapering below, and passing insensibly into a long slender root, giving off numerous branches, skin dark brown or nearly black, interior white; from the upper part of the rootstock are given off one or more very short thick lateral shoots each of which developes at the end a new pale-coloured tuber with a terminal bud and passing below into a filiform root. Flowering stem solitary, stout, erect, 2—4 feet high, unbranched, smooth, slightly hairy above, green. Leaves alternate, long-stalked, spreading, very deeply cut palmately into 5 or 3 segments, which are again deeply and irregularly divided into oblong acute laciniæ, dark green and shining above, paler beneath and slightly hairy. Flowers large, not very numerous, stalked, forming an erect rather lax terminal raceme; pedicels erect, downy, thickened at the end, in the axils of short, lanceolate bracts, and with two smaller bracts close to each flower. Sepals 5, petaloid, very unequal, deciduous, imbricate, dark blueish-purple, the upper one large, helmet-shaped, laterally compressed, pointed,

* *Aconitum*, *ἀκόνιτον*, the classical name for some plants of this genus.

† *Napellus*, a name given in the middle ages, from the shape of the root being somewhat like a small turnip, *napus*.

longitudinally ridged with nearly parallel veins, the two lateral ones broadly ovate, blunt, hairy within, the two lower oblong or lanceolate, unequal. Petals 2—8, unequal, the two posterior enclosed in the hood of the posterior sepal, arched and of very peculiar form, consisting of a long curved stalk, supporting at the end a small inflexed tongue-like blade which is prolonged backwards into a rounded hollow knob which forms a recurved apex to the petal, the remaining ones usually some (or all) suppressed or abortive, very small, subulate, very similar to the filaments. Stamens numerous, hypogynous, filaments rather long, dilated below, slightly hairy, the outer ones drooping, anthers small, roundish, 2-celled, dull green. Carpels 3, quite distinct, shorter than the stamens, somewhat divergent, ovary oblong, smooth, with numerous ovules in 2 rows, styles tapering, stigma faintly bilobed. Fruit of 3 follicles, erect, dry, papery, veined, scarcely an inch long, compressed-cylindrical, beaked by the recurved styles, dehiscent down the ventral suture. Seeds numerous, angular, irregularly pyramidal, brown, the testa thick, with irregular prominences and excavations, embryo very small at the base of the abundant endosperm.

Habitat.—In one or other of its forms the Aconite grows throughout Europe, except the extreme north and the south-west, and is widely distributed also through temperate and subarctic Asia and North America. It is especially a plant of subalpine pastures and wet shady places in hilly districts, and is common in the Alpine chains of Europe and also in the Himalaya range, where it extends from 10,000 feet elevation up to the limit of vegetation. In this country it can scarcely be considered a native, but occurs by some rivers in the west of England in a semi-wild condition. For medicinal purposes Monkshood is not much cultivated, the root of the wild plant being collected, but as an ornamental garden plant it is very familiar; the singular flowers are expanded in July, and are occasionally pale blue or white.

The varieties of *A. Napellus* are very numerous, depending on locality and elevation. For the European forms, many of which

are described as species, reference may be made to Reichenbach's elaborate memoir on the genus, quoted below, which contains coloured folio plates of most of them. One of these, *A. Stoerkeanum*, Reichenb., an alpine plant, is considered a good species by Koch and other botanists; it is figured in Hayne, xii, t. 15, Nees, Supp., and Berg and Sch., t. 28 e; its roots are also collected for use.

In the Himalayas similar variety prevails; the forms are grouped under four varieties in the "Flora of British India," one of which, var. *rigidum*, is the plant erroneously figured in the "Plant. Asiat. Rariores" by Wallich as his *A. ferox*.

Syme, E. Bot., i, p. 64; Hook. f., Stud. Fl., p. 11; Watson, Comp. Cyb. Brit., p. 87; Koch, Fl. Germ. & Helv., ed. 2, p. 25; Gren. & Godr., Fl. de France, i, p. 51; Ledebour, Fl. Rossica, i, p. 69; Hook. f., Fl. Brit. Ind., i, p. 28; DC., Syst. Veg., i, p. 371; Reichenbach, Illust. Spec. Aconiti Generis (1823–27); Lindl., Fl. Med., p. 7.

Official Parts and Names.—1. Aconiti Folia; the fresh leaves and flowering tops, gathered when about one third of the flowers are expanded, from plants cultivated in Britain: 2. Aconiti Radix; the dried root, imported from Germany, or cultivated in Britain, and collected in the winter or early spring before the leaves have appeared: 3. Aconitia; an alkaloid obtained from Aconite (B. P.). 1. The fresh leaves and flowering tops, gathered when about one third of the flowers are expanded, from plants cultivated in Britain: 2. The dried root, collected in the winter or early spring before the leaves have appeared (I. P.). 1. Aconiti Folia; the leaves: 2. Aconiti Radix; the root (U. S. P.).

1. Aconiti Folia.—*Collection and Drying.*—In the British and Indian Pharmacopœias the fresh leaves and flowering tops are directed to be gathered when about one third of the flowers are expanded, for the reasons explained by us under *Digitalis purpurea*. When carefully dried the properties of Aconite leaves are not sensibly impaired at first, but they are deteriorated by long keeping; hence in those countries in which the plant cannot be readily obtained in a fresh state, as in the United States, where

it is not generally cultivated, the Pharmacopœia of that country directs the recently dried leaves to be used.

General Characters and Composition.—The fresh leaves have no marked odour, and but little taste at first, being merely herbaceous, and very slightly bitter; but after a short time they are persistently burning, and cause a remarkable feeling of tingling and numbness in the mouth and throat.

The principal constituents of aconite leaves are *aconitia* in small proportion; and *aconitic acid.* The experiments of Schoonbroodt also indicate the probable presence of the *aconella* of Smith. *Aconitic acid* is the same substance as described by Braconnot, under the name of *Equisetic Acid,* and by Baup, as *Citridic Acid.* The characters of Aconitia, and of the other constituents of aconite leaves, are described below under Aconiti Radix and Aconitia.

2. Aconiti Radix.—*General Characters and Composition.*—When fresh aconite root varies in length from 3 to 6 or even in rare cases 8 inches. In form it closely resembles that of the common parsnip, being broad at the base, and tapering downwards to a fine thread-like point; the upper extremity is generally about the thickness of the middle finger, but frequently an inch or more in diameter. It descends perpendicularly into the earth, giving off in its passage numerous cylindrical rootlets, each being about the thickness of a common knitting needle. Both the root and rootlets are coffee-coloured or dark brown externally; and whitish internally. The odour is merely earthy; and the taste at first only very slightly bitter, but in a few minutes a burning sensation and a peculiar feeling of tingling and numbness is perceived in the lips, cheeks, and tongue.

As is noticed under *Cochlearia Armoracia,* aconite root has, notwithstanding its marked difference of appearance, been substituted for horseradish root, and thereby caused several fatal cases of poisoning. To the distinctive characters of the two roots there given in a tabular form, we may add that a pinkish colour is soon developed on the scrapings of aconite root.

Aconite root is most active in the winter months and early spring, when the leaves are absent, and it is only at such times that it can be mistaken for that of horseradish; and it is at such periods also that it is ordered to be collected in the British Pharmacopœia. When dried, in which state it is alone official, it is distinctly conical in form, 2 or more inches long, and from ½ to 1 inch thick at its upper extremity, where it is crowned with the remains of the stem. It is much shrivelled longitudinally, and is more or less covered with the broken rootlets. Externally it has a dark brown colour, and is white or brownish internally; it breaks with a short fracture, the exposed surfaces commonly exhibiting a somewhat mealy character, and are sometimes hollow in the centre. In taste it resembles that of the fresh root. Aconite root is by far the most active part of the plant; it is said to have six times the strength of the leaves.

The essential constituent of aconite root is *aconitia*, which will be described presently; it is combined with *aconitic acid*. Three other alkaloids have also been indicated as constituents of aconite root, namely, *napelline*, *aconella*, and one which was supposed by Groves to be identical with *atisine*, an alkaloid discovered by Broughton in *Atees*, and which is alluded to by us under *Aconitum heterophyllum*. *Napelline* was discovered by Hübschmann in 1857, and he afterwards thought it was identical with *acolyctine*, one of the alkaloids he had found in the root of *Aconitum Lycoctonum*, L. Napelline is described as a white powder, with a bitter and burning taste, having a strong alkaline reaction; and readily soluble in water, alcohol, or chloroform, but insoluble in ether. The so-called *aconella* was discovered by T. and H. Smith, of Edinburgh, in 1864, but they afterwards found it to be identical with *narcotia* or *narcotine*, one of the constituents of opium. Groves, who has investigated with great care and ability the chemical composition of aconite, was never able to detect aconella in aconite root. The third alkaloid supposed by Groves to be identical with the *atisine* or *atisia* of Broughton, is said by Alder Wright to be a new base altogether. It is described as being far less poisonous than aconitia, producing no

pricking of the tongue, but having only a bitter taste and being almost inert. Amongst the other constituents of aconite root that have been indicated, are *mannite, cane sugar, resin,* and *fatty matter.*

3. Aconitia or Aconitine.—This alkaloid is the constituent to which all parts of the aconite plant owe their medicinal properties. It is a most virulent poison. Aconitia exists in both an *amorphous* and a *crystalline* form. English manufacturers commonly obtain aconitia from Nepal or Indian Aconite root, as this root is said to yield at least three times as much alkaloid as that of the English plant; it is described under *Aconitum ferox.* The aconitia obtained from Indian aconite root, like that derived from the official aconite root, occurs in two forms—*crystalline* and *amorphous,* but in their chemical characteristics, as noticed in the description of Indian Aconite root, they present certain differences from the corresponding forms obtained from *Aconitum Napellus.* The aconitia of the root of *Aconitum ferox* is therefore distinguished as *Pseud-aconitia* or *Pseud-aconitine;* it has also been termed *English Aconitine, Napelline* (Wiggers), *Nepaline* (Flückiger), and *Acraconitine* (Ludwig).

The characters of aconitia as obtained by the process of the British Pharmacopœia are as follows:—"A white usually amorphous solid, soluble in 150 parts of cold, and 50 of hot water, and much more soluble in alcohol and in ether; strongly alkaline to reddened litmus, neutralising acids, and precipitated from them by the caustic alkalies, but not by carbonate of ammonia or the bicarbonates of soda or potash. It melts with heat, and burns with a smoky flame, leaving no residue when burned with free access of air." According to Herapath, the average produce of *the fresh root collected after flowering,* is 8·58 grains of aconitia in the pound; of the same *root dried,* 35·72 grains: but if obtained *before flowering,* the yield is only 3·5 grains in the pound of fresh root; and 12·13 grains per pound in the dried root.

Medical Properties and Uses.—Aconite is a powerful sedative, anodyne, diuretic, and antiphlogistic; and in large doses a

virulent poison. Under the influence of aconite the force of the circulation is reduced, and the frequency of the respirations diminished; and in fatal doses there is loss of sight, hearing, and feeling, followed by convulsions, syncope, and death. Locally applied to a painful part, it first produces a tingling sensation, which is succeeded by numbness and the cessation of pain. In all cases whether taken internally, or used as an external application, it appears at first to cause contraction of the pupil of the eye, and subsequently it is said dilatation. So far, however, as the alkaloid aconitia is concerned, Dr. John Harley says, that in poisonous doses, the pupil may be slightly dilated, or in the severer forms of poisoning contracted.

Aconite has been given internally in acute and chronic rheumatism, gout, and neuralgia; many painful affections of the heart, as angina pectoris, hypertrophy, and nervous palpitations; to relieve pain in carcinomatous affections; as an antiphlogistic in various inflammatory diseases, as pleurisy, pericarditis, pneumonia, erysipelas, and cynanche tonsillaris. Dr. Sidney Ringer, indeed, believes that if given sufficiently early, and in constantly repeated minute doses, it can cut short and limit the intensity of most acute inflammations. As a diuretic it is often given with benefit in dropsies. Notwithstanding the undoubted beneficial effects of aconite, it is but little employed internally, except by a few practitioners, a result probably due in a great measure to the dangerous symptoms of depression which sometimes ensue from its use; hence its action should in all cases be carefully watched; moreover, its effects are said to be only very temporary. Externally applied in the form of the official liniment, or of the liniment combined with chloroform, it is often of great value in different forms of neuralgia, and in chronic rheumatism; but care must be taken not to apply it to abraded surfaces, lest its too rapid absorption under such circumstances should produce poisonous symptoms.

The effects of aconitia are similar to those of aconite root and aconite leaves, although of course much more powerful. It is rarely, however, administered internally, on account of its power-

fully poisonous properties; but of its great efficacy when used externally in the form of the official ointment, in neuralgic and rheumatic affections, no one who has submitted it to trial can entertain a doubt. Dr. John Harley prefers the alkaloid in all cases, whether for internal or external use, or for subcutaneous injection; thus he says, "So long as the pure alkaloid can be obtained, the other preparations of aconite are not only superfluous but mischievous, for it is impossible to prepare them from year to year of uniform strength."

Per. Mat. Med., vol. ii, pt. 2, p. 687; Per. Mat. Med., by B. & R., p. 998; Pharmacographia, pp. 9–12; U. S. Disp., by W. & B., pp. 72 & 985; Garr., Mat. Med., p. 181; Royle's Mat. Med., by J. Harley, p. 773; Gmelin's Chemistry, vol. ii (1857), p. 402; Bentley, in Pharm. Journ., vol. xv, 1st ser., p. 449; Wittstein's Vierteljahresschrift, vol. xviii (1869), p. 82; Groves, in Pharm. Journ., vol. viii, 2nd ser., pp. 118 and 121, and Oct. 11, 1873, pp. 293–296; Groves, in Year Book of Pharmacy for 1874, p. 507; Wright, in Year Book of Pharmacy for 1875, p. 514; T. & H. Smith, in Pharm. Journ., vol. v, 2nd ser., p. 317; Flückiger, in Pharm. Journ., vol. ii, 3rd ser., p. 121; Garrod, in Med. Times and Gaz., Feb., 1864, p. 146; Hottot, in Journ. de Pharm., April, 1864.

DESCRIPTION OF PLATE.

Drawn from a plant in the Royal Gardens, Kew.

1. The summit of the flowering stem.
2. The base of the stem, showing the rootstock and young tubers.
3. The sepals separated.
4. Section to show the upper petals.
5. Section of flower, the sepals removed.
6. A stamen.
7. Stigma.
8. Transverse section of the ovary.
9. The fruit.
10. Seeds.
11. A seed.
12. Vertical section of the same.

(5–8, 11, 12, enlarged).

D. Blair ad. sicc. del. et lith.

M&N Hanhart imp

TINOSPORA CORDIFOLIA, *Miers*.

N. Ord. MENISPERMACEÆ.

Tribe *Heteroclinieæ*.

Genus Tinospora,* *Miers*. B. & H., Gen., i, p. 34; Miers, l. c., p. 29; Baill., iii, p. 13. Species 11, natives of Asia, Africa, and Australia, in the tropics.

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12. Tinospora cordifolia, *Miers in Ann. Nat. Hist., ser.* 2, vii, *p.* 38 (1851).

Gulancha (Hindustani).

Syn.—Menispermum cordifolium, *Willd.* Cocculus cordifolius, *and* C. convolvulaceus, *DC.*

Figures.—Rheede, Hort. Malab., vii, t. 21; Wight, Ic. Plant. Ind., ii, tt. 485, 486; Miers, Contrib. Bot., iii, t. 91.

Description.—A woody climber, with perennial stems reaching 2 inches in diameter, with a thick, soft, warted bark, the younger branches succulent with the bark smooth, giving out adventitious roots sometimes many yards in length and excessively slender, which lengthen downwards and at last reach the soil. Leaves alternate, on long flexuose petioles, spreading, 2—4 inches long, roundish-ovate, entire, cordate at the base, acute at the apex, quite smooth, thin, somewhat glaucous beneath. Flowers dicœcious, pedicellate, inconspicuous, yellow, in short, axillary, long-stalked racemes, the male in small fascicles, the female solitary, bracts minute. Male flowers:—Sepals 6 in two rows of 3 each, the outer short, roundish, the inner twice as long, broadly obovate, concave, smooth; petals 6, opposite the sepals, and about half the length of the inner ones, clawed below, somewhat 3-lobed above, with the lateral lobes involute; stamens 6, longer than the petals, immediately in front of which they stand and by which they are partially enwrapped, filaments much thickened at the end, anther-cells oblong, widely separated below; no rudiment of carpels. Female flowers:—Sepals as in the male; petals oblong-spathulate;

* Name from τείνω, to spread or extend, and σπορά, seed; from the extreme divarication of the cotyledons and the further extension of the endosperm curving round the hollow process of the putamen.

stamens reduced to small oblong scales in front of the petals; carpels 3, distinct, opposite the outer sepals, elevated on a thick gynophore, ovary oblong-ovoid, smooth, style short, thick, stigma dilated, tongue-shaped, laciniate. Fruit of 3 (or more usually less by abortion) shortly stalked, subglobose drupes, with an apiculus on one side marking the position of the style, about as large as a pea, red, pulp scanty, putamen thin, bony, convex outside, with a deep, large, hollow process extending to the middle of the fruit on the ventral surface, making the cavity horse-shoe-shaped. Seed similar in form to the cavity which it fills, embryo enclosed in the copious endosperm which is ruminated on the hollow, ventral surface, radicle rounded, superior, cotyledons leafy, ovate, veined, very divaricate.

Habitat.—This species is found throughout the Indian Peninsula and extends into Ceylon, Burmah, and Assam. It is said to climb over the highest trees, and to throw out aerial roots which reach the length of 30 feet, though not thicker than pack-thread.

Miers, Contrib. Bot., iii, p. 31; Fl. Brit. Ind., i, p. 97.

Official Parts and Names.—Tinosporæ Radix et Caules; the root and stems, collected during the hot season, when the bitter principle is most abundant and concentrated (I. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of the United States.

General Characters and Composition.—As met with in the bazaars of India, where it is known under its Hindustani name of *Gulancha,* it consists of the dried transverse slices of the cylindrical woody stems. These pieces vary in length from about ½ an inch to 2 inches, and in diameter from ¼ of an inch to 2 inches, averaging about ½ an inch. They present a more or less shrunken appearance, especially those that have been obtained from the younger stems; and are covered with a smooth, translucent, shrivelled bark, which becomes rough, and of a dull appearance with age. In many cases the pieces are marked externally with warty protuberances, and the scars of adventitious roots. The surfaces of the pieces exhibit a radiated appearance, being marked

by large medullary rays separating the woody portion into a corresponding number of wedge-shaped bundles, which have a very porous structure, but no concentric layers. Gulancha has no odour, but a very bitter taste. In the Bengal Dispensatory, the root is described by O'Shaughnessy, to be of large size, and soft and spongy.

Nothing satisfactory is known of the chemical composition of Gulancha. Its infusion is not blackened by a persalt of iron. The bitter principle to which it owes its properties does not appear to have been examined.

Medical Properties and Uses.—Gulancha is reputed to possess tonic, antiperiodic, and diuretic properties. Its uses were more especially made known by Dewan Ramcomul Sen, in 1827, and its properties have been subsequently testified to by O'Shaughnessy, Waring, and many other Indian practitioners. Waring says, Gulancha renders "the Indian practitioner in a great measure independent of foreign medicines of the same class. It is a remedy highly esteemed by the Hindoos, and one which might be advantageously admitted into European practice, being abundant, cheap, and efficacious as a general tonic. The extract, called by the Hindoos *Palo,* is considered to be possessed of great power." It is of more value as a bitter tonic than as an antiperiodic.

Gulancha is regarded as especially valuable in general debility after fevers and other exhausting diseases. It is also reputed to be a useful remedy in secondary syphilitic affections, chronic rheumatism, and mild forms of intermittents. Speaking of its employment as an antiperiodic, Waring states, that he employed it in twenty cases of ordinary quotidian fevers, in Burmah; and in each case it prevented the accession of the cold stage, but it did not appear to diminish the severity, or prevent the regular return of the hot stage, a peculiarity, he adds, not observed by him in the use of any other remedy of the same class.

Gulancha is also regarded by the natives in certain parts of India, as a specific for the bites of poisonous insects and venomous snakes.

Waring's Man. Pract. Therap., p. 245; Bengal Dispensatory,

p. 198; Pharm. of India, pp. 9 and 435; Pharmacographia, p. 32; Trans. of Med. and Phys. Soc. of Calcutta, vol. iii, p. 294, vol. iv, p. 431, and vol. vii, p. 15.

DESCRIPTION OF PLATE.

Drawn from specimens in the British Museum, collected in India by Roxburgh and Wight.

1. Branch of a female plant with flowers.
2. A female flower.
3. Outer sepal.
4. Inner sepal.
5. Petals and abortive stamens.
6. Carpels and gynophore.
7, 8. Fruit.
9. Vertical, and—10. Transverse section of the same.
11. Embryo.
12. A male flower (stamens and petals should be opposite the sepals, not alternate).
13. Outer sepal.
14. Inner sepal, petal and stamen.

(2–6, 8–14 enlarged.)

D. Blair ad sioc del et lith.

M & N Hanhart imp.

MUCUNA PRURIENS, *D.C.*

N. Ord. LEGUMINOSÆ.

Tribe *Phaseoleæ*.

Genus **Mucuna**,* *Adans.* B. & H., Gen., i, p. 533. Baill., Hist. Pl., ii, p. 248. Species about 22, natives of tropical countries in both hemispheres.

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78. Mucuna pruriens,† *DC. Prod.*, ii, *p.* 405 (1825).

Cowhage.

Syn.—Dolichos pruriens, *Linn.* Stizolobium pruriens, *Pers.* Mucuna prurita, *Hook.* Carpopogon pruriens, *Roxb.*

Figures.—Woodville, t. 153; Steph. & Ch., t. 179; Jacquin, Ic. Americ., t. 122; Wight, Ic., t. 280; Bot. Register, 1858, t. 18; Bot. Miscell., ii, Supp., t. 13; Fl. Brasil. fasc. 24, t. 46, f. 2.

Description.—A large half-woody twiner, with long slender cylindrical branches, at first covered with short reflexed hairs, afterwards nearly smooth. Leaves alternate, pinnately trifoliolate, on hairy petioles 6—12 inches long, stipules small, lanceolate; leaflets on short, thick, hairy stalks, with setaceous stipellæ at their base, 6—8 inches long, the terminal one the smallest, rhomboid-ovate, the lateral ones broadly ovate, very unequal at the base, the lower side being much expanded, all acute or acuminate, entire, membranous, green on both surfaces, nearly smooth above, covered below with adpressed white hairs, especially abundant on the prominent veins. Flowers large, shortly stalked, in clusters of two or three together, in a pendulous, long-stalked, axillary raceme a foot or more in length, rachis and pedicels pilose, bracts ½ an inch long, lanceolate, densely hairy, falling before the flowering period. Calyx cup-shaped, silky externally, deeply cleft in a somewhat two-lipped manner, the two upper segments being perfectly united to form a single triangular one, and the lower three lanceolate, subulate, the middle one the longest. Corolla papilionaceous,

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* *Mucuna* "is the Brazilian name of a species mentioned in 1648 by Marcgraf."

† *Pruriens*, itching, from the effects of the hairs on the skin.

standard broadly oval, acute, about ¾ inch long, with a short claw, pale purplish, wings nearly 1½ inch long, narrow, oblong, blunt, slightly falcate, dull dark purple tinged with pale yellowish-green. Keel-petals narrow, a little longer than the wings, nearly straight, except at the end, where they become hard and cartilaginous, and curve upwards, forming a prominent, stiff, greenish beak. Stamens 10, 9 combined by their filaments, the upper one distinct, fore part of the filaments somewhat dilated, anthers small, soon falling, oblong. Ovary surrounded at the base by a small crenulate disk, shortly stalked, hairy, tapering into the long slender style, stigma small, terminal. Legume nearly sessile, about 3 inches long by more than ½ inch broad, falcately curved at each end, somewhat compressed, slightly contracted between the seeds, dark brown, very densely covered with a thick felt of stiff, short, sharp, pale reddish hairs, which point backwards and are readily detached; when young the pods have a strongly marked rib down each valve, which is concealed by the hairs. Seeds 4 or 5, separated by cellular partitions, about ¼ of an inch long, ovoid, somewhat compressed, smooth, brownish, mottled with black, hilum large, oblong.

Habitat.—This is a common twiner over bushes and hedges in peninsular India, where it is extensively distributed, and is probably native. The plant occurs in a cultivated or semiwild state throughout the tropical regions of both hemispheres.

The meaningless word "cowitch" is a corruption of the Hindustani name for the plant, variously spelt cowhage, couhage, kiwach.

Roxburgh, Fl. Indica, iii, p. 283; Hook., Bot. Miscell., ii, p. 348; Fl. Brasil., fasc. 24, p. 169, Fl. Trop. Africa, ii, p. 187; DC., Prod., ii, p. 404; Lindl., Fl. Med., p. 253-4.

Official Part and Names.—MUCUNA, *Cowhage;* the hairs of the pod (I. P.). MUCUNA; the hairs of the pods (U. S. P. *Secondary*). It is not official in the British Pharmacopœia, but it was formerly official in the London, Edinburgh, and Dublin Pharmacopœias.

General Characters and Composition.—The pods or legumes are imported from the West Indies with the hairs attached. The

legumes, which are somewhat compressed, vary in length from about 2 to 5 inches, averaging about 4 inches, and are commonly about ½ an inch in breadth; they are slightly curved at each end, and contain from four to six seeds. They have a dark rich-brown colour, and are densely covered with stiff brownish-red hairs, each of which is about $\frac{1}{10}$ of an inch in length. These hairs, which are readily separated from the legumes, constitute the official *Cowhage;* it is also termed *Cow-itch.* When examined by a magnifying lens, each hair is seen to consist of an acutely pointed conical cell, which is slightly serrated towards its apex. When handled or incautiously touched, the hairs penetrate the skin, and produce an intolerable itching. As a general rule they are filled with air, but sometimes they contain a granular matter, of which *tannic acid* is one of the constituents.

Medical Properties and Uses.—Mucuna is a mechanical anthelmintic; that is, the hairs when given medicinally, pierce the bodies of intestinal worms, and by thus causing them to writhe, they become detached from the walls of the intestines. That their action is thus mechanical is proved by the fact, that neither the administration of the tincture, decoction, or any corresponding preparation of mucuna, is in any degree anthelmintic. Cowhage has little or no effect upon the tape-worm, but has been more especially employed with success for the expulsion of the large round worm (*Ascaris lumbricoides*), and to some extent also, for that of the small thread-worm (*Oxyuris vermicularis*). The best mode of administering cowhage is in the form of an electuary with treacle, syrup, or honey. The legumes should be dipped in the vehicle, and then scraped until the mass has the consistence of an electuary, or of thick honey; and of this mixture a table-spoonful may be given to an adult, and a teaspoonful to a child, for three or four successive mornings. This should be followed by a brisk purgative, which will in general bring away the worms. Mucuna is, however, but little used at the present day, although its efficiency is undoubted. It is, moreover, generally a safe remedy, but severe enteritis has sometimes followed its administration. Mucuna has also been used externally in the form of an ointment,

and in other ways, as a local stimulant in paralysis, and other affections.

A decoction of the root or of the legumes is said to be diuretic, and was formerly employed in dropsy; and according to Ainslie, an infusion of the root is used by the natives in some parts of India as a remedy in cholera. The seeds are also employed medicinally in India.

The legumes when young and tender are also cooked and eaten in India.

Per. Mat. Med., vol. ii, pt. 2, p. 322; Pharmacographia, p. 165; U. S. Disp., by W. & B., p. 567; Browne's Jamaica, p. 291; Chamberlaine's Prac. Treat. on Stizolobium or Cowhage, 9th edit., pp. 57 and 65.

DESCRIPTION OF PLATE.

Drawn from Indian specimens in the herbarium of the British Museum.

1. A leaf and raceme of flowers.
2. Calyx and andrœcium.
3. Pistil.
4. A pod.
5. Section of part of pod showing the seed.
6. Seed.
7. Section of the same.
8. A single hair from the pod, enlarged.
9. The point of the same, more magnified.

D.Blair, ad nat. del. et lith.

M & N. Hanhart imp.

INULA HELENIUM, *Linn.*

N. Ord. COMPOSITÆ.

Tribe *Inuloideæ*.

Genus Inula,* *Linn.* B. & H., Gen., ii, p. 330. Species 56, natives of Europe, Africa, and Asia, chiefly in temperate countries.

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150. Inula Helenium, *Linn., Sp. Plant., ed.* 1, *p.* 881 (1753).

Elecampane.

Syn.—Corvisartia Helenium, *Merat.*

Figures.—Woodville, t. 26; Hayne, vi, t. 45; Steph. & Ch., t. 49; Nees, t. 240; Berg & Sch., t. 22 f.; Syme, E. Bot., v, t. 766; Reichenbach, Ic. Fl. Germ., xvi, t. 921.

Description.—A perennial herb with a large, somewhat flat, many-headed rootstock, very thick and fleshy, extending below into a fusiform root with thick succulent branches. Stem reaching 5 feet high, usually about 3 feet, erect, thick, striate, solid, shortly hairy or woolly, corymbosely branched at the top. Root-leaves very large, long-stalked, about 18 inches long, oblong-oval, tapering at both ends and much attenuate and decurrent along the petiole; stem-leaves sessile, or nearly so, ovate acute, the upper ones amplexicaul; all finely and rather irregularly serrate-dentate, smooth and green above, veiny, greyish and shortly but densely woolly beneath. Heads very large, solitary, terminating the branches, 2½ inches or more wide; involucral scales imbricated in several rows, erect, the outer ones very large and leaflike, broadly oval, with the points recurved, the inner ones narrower, thickly downy outside, and with ciliated margins, the innermost linear, acuminate, glabrous; receptacle broad, nearly flat, naked, with a shallow excavation for each flower. Disk-flowers very numerous, bisexual; corolla tubular, slightly wider upwards, 5-toothed, yellow; anthers with long rough tails at the base; stigmas bifid,

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* *Inula*, a Latin classical name for the plant, and perhaps a contraction of the word *Helenium*, ἑλένιον, which was applied to the same species. By the mediæval writers it was written *Enula*. Elecampane is a corruption of the ante-Linnæan name, *Enula campana*.

the upper surfaces of the branches papillose. Ray-flowers female, numerous, in a single row; corolla ligulate, nearly an inch long, spreading, narrowly linear, 3-toothed at the apex, yellow. Fruit $\frac{1}{6}$ inch long, smooth, pale brown, somewhat compressed, 4-ribbed, pappus long, whitish, hairs rough, in a single row, spreading.

Habitat.—Elecampane is a widely distributed though scarcely a common plant in England, occurring in damp pastures and shady ground; it lies under the suspicion of alien origin here in consequence of its having been formerly much cultivated by country people, but is probably truly a native plant in southern England, though considered certainly introduced into Scotland. Elsewhere it has a wide distribution through all central and south Europe, and it extends eastwards as far as S. Siberia and N. W. India.

It flowers in July and August, and is a striking and handsome plant. After the flowers have fallen, the involucral scales spread horizontally and the removal of the fruit shows the beautifully regular arrangement of the little pits on the receptacle which form a pattern, like the engine-turning of a watch.

Syme, E. Bot., v, p. 97; Hook. f., Stud. Fl., p. 198; Watson, Comp. Cyb. Br., p. 232; Koch, Fl. Germ., p. 392; Lindl., Fl. Med., p. 456.

Official Part and Name.—INULA; the root (U. S. P. *Secondary*). It is not official in the British Pharmacopœia, or the Pharmacopœia of India; but it was formerly official in the London and Dublin Pharmacopœias.

Collection and Preparation.— When required for medicinal use, the roots are obtained from plants two or three years old, those of older growth being too woody. The larger portions are then variously sliced both transversely and longitudinally, and dried; while the smaller portions are dried entire.

General Characters and Composition.—The dried root, as seen in commerce, essentially consists of transverse or longitudinal slices, which are variously twisted or curled from the contraction they have undergone in the process of drying; and mixed with

these may frequently be seen smaller pieces of the entire root of various lengths. The pieces have a brownish colour externally, and are yellowish-grey internally; they have a somewhat horny character, and break with a close smooth fracture. Elecampane root has at first a somewhat glutinous taste, but by chewing it becomes subsequently aromatic, and slightly bitter and pungent; it has an agreeably aromatic, somewhat camphoraceous orris-like odour.

The principal constituents of elecampane are *bitter extractive, helenin,* and *inulin;* a trace of *volatile oil* is also present. The tonic properties of the root are said to reside in the bitter extractive. *Inulin,* which has the same composition as starch, was first discovered by Valentine Rose in this root. It is of common occurrence in the roots of the Compositæ, and at present has not been found in the plants of any other order. As usually seen it is a white powder, without taste or odour. It is coloured yellow by iodine, and is readily soluble in about three parts of boiling water, forming a clear solution, but on cooling the inulin is nearly all deposited. By these characters it may be readily distinguished from ordinary starch. Inulin is most abundant in the root in autumn, thus Dragendorff obtained from it in October as much as 44 per cent., but in spring only 19 per cent. By immersing elecampane root in glycerine or alcohol, as first shown by Sachs, inulin is precipitated in globular aggregations of needle-shaped crystalline forms. *Helenin* was, until recently, considered as a distinct body, and was commonly known as *elecampane-camphor;* but from the researches of Kallen, it would appear to be resolvable into two crystallizable substances, which he has named *helenin* and *alantcamphor* or *elecampane-camphor.* Helenin is described as a body without taste or odour; and alantcamphor as having a peppermint odour and taste. Further research by the same experimenter has shown that when elecampane root is exhausted with alcohol, and the extract is precipitated with water, the crystals then obtained contain, besides helenin, two other bodies. One of these has not yet been obtained pure, but it is without doubt isomeric with laurel-camphor. This he terms *inulol;* the other,

which exists in much larger quantity, is the anhydride of an acid called *inulic acid.*

Medical Properties and Uses.—Elecampane has been regarded as an aromatic tonic; and also as diaphoretic, diuretic, expectorant, and emmenagogue. It was formerly highly valued, but it is now but rarely employed except in veterinary practice. It has been prescribed in chronic catarrh, and in dyspepsia attended with relaxation and debility; and in the United States it has been also highly recommended both for external use and internal administration, in tetter, psora, and other diseases of the skin.

Elecampane is one of the substances used in France and Switzerland in the preparation of *Absinthe,* a liqueur which is described under *Artemisia Absinthium.*

Per. Mat. Med., vol. ii, pt. 2, p. 16; Steph. & Church., Med. Bot., by Burnett, vol. i, pl. 49; Pharmacographia, p. 340; U. S. Disp., by W. & B., p. 479; Gmelin's Chemistry, vol. xvii, p. 522; Kallen, in Berichte der Deutschen Chemischen Gesellschaft, 1874, p. 1506; Dragendorff, Materialien zu einer Monographie des Inulins, St. Petersburg, 1870; Prantl's Inulin, in Pharm. Journ., vol. ii, 3rd ser., p. 262; Pharm. Journ., 3rd ser., vol. vii, p. 156.

DESCRIPTION OF PLATE.

Drawn from a specimen in Kew Gardens.

1. Upper part of a flowering stem.
2. Section of a flower-head.
3. A disk flower.
4. Section of the same.
5. A ray-flower.
6. The stamens.
7. A stamen, more enlarged.
8, 9. Fruit.
10. Vertical, and—11. Transverse section of the same.

(2–11 magnified.)

D.Blair ad nat.del. et lith.

M & N.Hanhart, imp.

N. Ord. COMPOSITÆ.

Tribe *Anthemideæ*.

Genus Anacyclus,* *Linn.* B. & H., Gen., ii, p. 419. Species 10, natives of the Mediterranean region.

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151. Anacyclus Pyrethrum,† *DC., Flore Franc.*, v, *p.* 480 (1815).

Pellitory of Spain. Pellitory.

Syn.—Anthemis Pyrethrum, *Linn.* Anacyclus pseudo-Pyrethrum, *Ascherson.*

Figures.—Woodville, t. 20; Steph. & Ch., t. 97; Nees, t. 244; Lamarck, Illustr., t. 683, f. 4; Miller, Ic., t. 38; Reich., Ic. Fl. Germ., t. 999.

Description.—A perennial herb with numerous spreading, prostrate or ascending, branched stems, more or less hairy in their upper portions, nearly smooth below, and coming from the crown of a long, tapering, vertical, brown, slightly branched root. Leaves alternate, the ones at the root-crown long-stalked, ovate or oblong in outline, deeply bipinnatisect, segments linear, acute, often again 2- or 3-fid, more or less hairy or nearly glabrous. Heads terminal, large, 1—1½ inch or more wide, with a wide disk; involucral scales in several rows, imbricated, ovate-lanceolate, varying in width, blunt or subacute, smooth, pale-green, bordered with an edge of brown; receptacle slightly convex, with large obovate rounded transparent scales beneath the flowers. Disk-flowers bisexual, corolla tubular, contracted below, with 5 equal triangular spreading teeth, yellow; anthers apiculate, not tailed at the base, included in the corolla; style exserted, stigma bifid, with 2 linear branches. Ray-flowers female, in a single row, corolla ligulate, the limb broadly oval, trifid at the apex, white above, tinged with bright pink below. Fruit

* *Anacyclus*—abridged from *Ananthocyclus*, Vaillant's name for the genus—from *ἀ* not, *ἄνθος* flower, and *κύκλος* a circle, in allusion to the outer ovaries being without flowers (Théis).

† *Pyrethrum*; the *πύρεθρον* of Dioscorides (perhaps really applied to more than one plant) was referred to this by the botanical writers of the pre-Linnean period.

dorsally compressed, obovoid, smooth, the outer ones at least drawn out at each edge into a narrow wing, more or less deeply denticulate above forming a short scarious pappus, and prolonged at the sides into two short auricles.

Habitat.—Though called Pellitory of Spain, this plant does not grow wild in Europe; but is confined to Algeria, where it is found not uncommonly in the higher plains at some distance from the coast, flowering from April till June. It is also grown for use in that country. As a cultivated plant it has long been known in Europe, and is a very old though rather rare inhabitant of English gardens, having been grown here by Lobel in 1570, and Gerard in 1596. It is said very rarely to ripen seed in this country.

The plant figured is that called by Ascherson *A. pseudo-Pyrethrum* (*A. Pyrethrum*, Cassini, non DC., according to him), and differs from the true plant in its smaller heads, greener involucral scales, with the brown rim narrower, and a broader and more denticulate wing to the fruit; though these characters are easily observed, the two plants do not appear to be distinguished in this country, but are both grown under the name of *A. Pyrethrum*. Of the figures quoted above, Reichenbach's and perhaps Nees's certainly represent *A. pseudo-Pyrethrum*, Asch.

DC. Prod., vi, p. 15; Desfont., Fl. Atlantica. p. 287; Ascherson, in Bonplandia, 1858, p. 118; Lindl., Fl. Med., p. 460.

Official Part and Names.—Pyrethri Radix; the root (B. P.). The root (I. P.). Pyrethrum; the root (U. S. P. *Secondary*).

Collection and Commerce.—Pellitory root is chiefly collected in Algeria, from whence it is exported either by way of Oran and Algiers; or it is forwarded from Algeria to Tunis, then shipped to Leghorn and Egypt, and from Egypt it is exported in large quantities to India.

General Characters and Composition.—Pellitory root, Pellitory, or as it is also called Pellitory of Spain, occurs in pieces, which on an average are about the thickness and length of the little finger, but varying in these respects from about 2 to 4 inches in

length, and from ½ an inch to nearly ¾ of an inch in thickness. The pieces are straight or slightly curved, cylindrical or somewhat tapering, and occasionally crowned above by the remains of leaves; they are unbranched, but are sometimes furnished with a few hair-like rootlets. The external surface is brown, rough, shrivelled longitudinally, and marked by numerous dark-coloured receptacles of resin. Pellitory root is brittle, and breaks with a close, compact, resinous fracture; the fractured surface shows no trace of pith, but presents a radiated appearance from the large size of the medullary rays, and is marked by numerous dark-coloured receptacles of resin. It has no very evident odour, only feebly aromatic; and but little taste at first, but when chewed, it excites a singular burning and pricking sensation over the whole mouth and throat, which remains for some time, and causes a copious flow of saliva.

Pellitory root has been frequently analysed, and its activity proved to reside in an acrid matter, called by Parisel *pyrethrin*. But this so-called *pyrethrin* is, in reality, a mixed substance, consisting, according to Koene, of a *brown acrid resin*, which is probably the more important principle, and the one in which the activity of the root essentially resides; of an *acrid brown fixed oil*, and *a yellow acrid oil*. The root also contains *inulin* in large proportion, a little *volatile oil*, *gum*, a trace of *tannic acid*, and other constituents of no particular importance.

Medical Properties and Uses.—Pellitory is a powerful irritant and sialagogue, and when applied to the skin, it acts as a rubefacient. It is rarely or ever given internally; but is chiefly used as a masticatory, or in the form of a gargle prepared by diluting the official tincture with water. As a masticatory it has been found useful in toothache, aphonia, paralysis of the tongue and muscles of the throat, and in neuralgic affections of the teeth, &c. As a gargle it is often employed with advantage in relaxation of the uvula or tonsils, and in other cases. A few drops of the tincture are also sometimes applied on cotton wool to the cavity of a decayed tooth for the relief of toothache. A recent case reported in the *Practitioner* shows the necessity of exercising

caution in its use, for the swallowing by a child of three and a half years old, of about fifty minims of the tincture, was followed by profuse perspiration and restlessness, succeeded by an exhausting and painful diarrhœa, then by stupor, rapid and weak pulse, and twitching of the limbs, and subsequently after fourteen hours by violent convulsions which left the child apparently moribund, but he ultimately recovered under treatment by enemata of starch with five drops of tincture of opium, port wine and coffee, and by the application of ice to the forehead and spine.

In India and some other parts of the East it is a favourite remedy; it is given internally by the Mahomedans, as a cordial and stimulant, in the lethargic stages of typhus fever, and in paralytic affections.

Per. Mat. Med., vol. ii, pt. 2, p. 21; Pharmacographia, p. 342; U. S. Disp., by W. & B., p. 719; Waring's Man. Pract. Therap., p. 601; Ainslie's Mat. Med. of Hindostan, p. 34; O'Shaughnessy's Bengal Disp., p. 414; H. Langley Brown, in Practitioner for August, 1876.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Royal Gardens, Kew.

1. A prostrate stem with numerous flower-heads.
2. Section of a flower-head.
3. A disk-flower.
4. Section of corolla.
5. A ray-flower.
6. A stamen.
7. The stigma.
8. Scale from the receptacle.

(2–8 enlarged.)

D. Blair ad. nicc. del. et lith.

M&N Hanhart imp.

ARTEMISIA PAUCIFLORA, *Web.*

N. Ord. COMPOSITÆ.

Tribe *Anthemideæ*.

Genus Artemisia, *Linn.*

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157. Artemisia pauciflora, *Weber, in Stechm. de Artem., p.* 26 (1775) (non *Willd.* nec *Bieb.*)

Syn.—A. maritima, var. Stechmanniana, *Besser*. A. maritima, var. pauciflora, *Ledebour*. A. Lercheana, *Kar. & Kir.* (non *Weber in Stechm.*)

Not previously figured.

Description.—A small, semi-shrubby perennial with an oblique knotted, fibrous rootstock branching from the crown, from which and from the old branches arise numerous short leafy shoots, and many erect flowering stems about 1 foot high. Stems slender, cylindrical, at first uniformly woolly with a fine white tomentum, afterwards glabrous and woolly in patches, at first leafy in the lower part, afterwards bare, much branched above, branches erect. Leaves small, the largest under 1 inch long, alternate, those on the leafy shoots long-stalked, deeply bipinnatisect, the segments linear blunt, sometimes again trisected, involute when young and very woolly, afterward greyish; the stem-leaves on shorter stalks and with narrower segments, soon withering off, the uppermost ones simple. Heads small, about $\frac{1}{10}$ inch long, oblong-ovoid, blunt, sessile or shortly stalked in the axils of shorter linear leaves, erect, arranged somewhat densely along the upper portions of the slender virgate branches, forming interrupted, elongated, spike-like panicles, the whole making up a rather dense, erect, broom-like inflorescence; scales of the involucre 12—18, imbricate, the outer ones shortest, the innermost longest, oblong, blunt, concave, the inner ones incurved at the apex, all with a broad, thick, yellowish-green midrib, usually with a little short greyish wool and (except the outermost) bordered with a transparent, scarious, glabrous border (widest in the inner scales), in which are numerous scattered glands. Flowers 3 to 5 in each head; calyx-limb a mere rim; corolla broadly tubular, slightly

and gradually narrowed to the base with 5 short triangular segments, the tube dotted externally with glands; stamens with a long terminal apiculus, pointed but not tailed at the base; style with 2 short thick branches, wider upwards and brush-like at the ends.

Habitat.—This kind of wormwood grows in the desert plains or steppes of several parts of Russia, especially in the districts near the lower part of the course of the great rivers Volga and Don, as the neighbourhood of Sarepta, and much further to the east, in the Kirghiz desert of Russian Turkestan, where it is very abundant, and its flower-heads are largely collected for commerce; it doubtless also occurs in intermediate localities.

In all the specimens of typical *A. pauciflora* examined the flowers are in bud or rudimentary. The *flowers* above described are those of a plant in Pallas's herbarium in the British Museum (labelled "*A. Contra*"), which slightly differs from the plant figured and furnishing the rest of the description in having the heads a little larger and the involucral scales slightly spathulate.

The identification of the drug wormseed with this plant is due to Besser, who states that it was then (1834) collected about Sarepta for the druggists. A careful comparison of the commercial heads and those of the present plant has convinced us that they are identical, and there can be little doubt that, as stated by the authors of "Pharmacographia," at least the chief part of the drug is furnished by it.

With regard to other alleged sources. The *A. santonica* of Woodville, t. 25 (figured from a plant then in cultivation under that name at Kew), has heads which bear no resemblance to the drug. *A. Vahliana*, Kostel., which had long been considered by German botanists as the source of the wormseed of trade, is figured in Berg and Sch., t. 29 c, to show how unlike it is to the drug itself, specimens of which are drawn on the same plate for comparison, and bear the name of *A. Cina*. As this name of Berg's was bestowed in advance on an (to him) unknown plant, it has no real claim to be used scientifically. Willkomm, however, in 1872 maintained the name for a plant which he fully

describes as the mother-plant of wormseed, and which was brought from Turkestan by Petzholdt. From the description, this *A. Cina*, Willk. must be very close indeed to *A. pauciflora*; the authors of "Pharmacographia," however, who have had the opportunity of examining an authentic specimen, state that the "flower-heads do not entirely resemble the wormseed of trade in that they have fewer scales."

In adopting here the specific name *A. pauciflora*, Web., it is not intended to express any opinion on the validity of that species, but merely to indicate definitely the plant intended. Most botanists who have studied the numerous and puzzling varieties of these Russian *Artemisiæ* agree in referring the present, along with many other described species, to the common and widely-spread *A. maritima*, Linn., which is frequent on the British coasts and extends under various forms throughout Europe and W. Asia in salt marshes and saline tracts.

Barbary wormseed is referred to *A. Sieberi*, Besser (*A. glomerata*, Sieber, *A. contra*, Linn. ?) by Batka, and to *A. ramosa*, C. Smith, by Berg.

Besser, in Bull. de la Soc. Imp. des Nat. de Moscou, vii (1834), p. 31; DC. Prod., vi, p. 102; Ledebour, Fl. Rossica, ii, p. 570; Willkomm, in Bot. Zeit., 1872, 130, abstracted in Pharm. Journ., 1872, p. 762; Flück. & Hanb., Pharmacogr., p. 346; Batka, in Nova Acta Acad. Cæs. Leop.-Carol., xiii (1827), p. 2.

Official Parts and Names.—1. SANTONICA; the unexpanded flower-heads of an undetermined species of Artemisia, *Linn.*: 2. SANTONINUM; a crystalline neutral principle prepared from Santonica (B. P.). The unexpanded flower-heads (*Santonica*) of a species of Artemisia (I. P.). SANTONICA; the unexpanded flowers of Artemisia Cina (*Willkomm*) (U. S. P.).

1. SANTONICA.—*Collection and Commerce.*—From information communicated to Flückiger and Hanbury, it would appear that Santonica is now chiefly, if not entirely, collected on the steppes or vast plains of the Kirghiz, in the northern parts of Turkestan. It is thence forwarded to the great fair of Nishnei-Novgorod, whence

it is distributed to Moscow, St. Petersburg, and Western Europe. The average imports into St. Petersburg, according to Ludwig, in 1862, 1863, and 1864 were about 10,000 cwt. No other later or reliable statements are available.

General Characters and Composition. — This drug, which consists of the minute unexpanded flower-heads resembling seeds in appearance, is known under various names, as *Santonica, Semen Santonicæ, Semen Cinæ, Semen Contra, Semen Sanctum, Wormseed,* and others. The best specimens of santonica are composed almost entirely of the minute unexpanded and unbroken flower-heads; but in commercial specimens we frequently find a variable proportion of stalks and small portions of leaves intermixed with the flower-heads (*capitula*). Flückiger and Hanbury say that, the flower-heads "are so minute that it requires about 90 to make up the weight of one grain." The characters of the capitula are fully given in our botanical description, and those of commercial santonica are thus summed up in the British Pharmacopœia :— "Flower-heads rather more than a line in length and nearly half a line in breadth, fusiform, blunt at each end, pale greenish-brown, smooth; resembling seeds in appearance, but consisting of imbricated involucral scales with a green midrib, enclosing four or five tubular flowers. Flower-heads not round or hairy." Santonica has a bitter, somewhat camphoraceous taste; and when rubbed, it has a strong and agreeable odour, suggestive of camphor and cajuput oil.

The principal constituents of santonica are a *volatile oil, resin,* and a crystalline principle, which is described below under the name of *santonin.* The volatile oil has the peculiar odour and taste of the drug, and is contained in it, in the proportion of about 1 per cent. It boils at about 347°, and is chiefly composed of a substance which has been termed *Cinæbene-camphor.* The anthelmintic properties of santonica appear to be entirely due to santonin.

2. Santoninum.—Santonin or Santonine exists in the drug in proportions varying from 1½ to 2 per cent., and the amount, it is said, rapidly decreases as the flowers expand. Santonin,

as obtained by the process of the British Pharmacopœia, is in colourless flat rhombic prisms, inodorous, feebly bitter fusible, and sublimable by a moderate heat; scarcely soluble in cold water, and but sparingly so even in boiling water, but abundantly in chloroform and in boiling rectified spirit. It is also soluble in the fixed oils; and solutions of the caustic fixed alkalies, and forming with the latter definite compounds, one of which, *Santonate of Soda,* has been employed in medicine instead of santonin; it has the recommendation over it of being soluble in water. Santonin is neutral in its action on test-papers, though capable of combining with bases, as just described. By exposure to daylight, or to the blue or violet rays of the spectrum, the crystals of santonin become yellow; a change which appears to be of a mechanical nature, for, so far as is known, it is unattended by any chemical alteration. Santonin is entirely destructible by a red heat with free access of air. According to the investigations of Hesse, santonin is the anhydride of an acid, which he has called *Santoninic acid,* a crystalline body which, when heated to 248°, is resolved into santonin and water. Cannizzaro and Sestini have also shown that when heated with an alkali, santonin is converted into an acid which they have called *santonic acid,* which is isomeric with santoninic acid, but not resolvable like it into santonin and water; and very recently the same investigators have noticed that santonin in combining with the elements of water yields numerous bodies, one of which is santonic acid.

3. Other Varieties of Santonica.—Besides the official kind of santonica, as described above, and which is distinguished in commerce under the name of *Levant* or *Alexandrian Wormseed;* another variety of wormseed has also been especially described by pharmacologists under the name of *Barbary Wormseed.* Nothing definite is known of its botanical or geographical source, or of its chemical composition; but it is said, although, so far as we know, on no published authority, that santonin cannot be obtained from it. Barbary Wormseed may be readily distinguished from the official or Levant Wormseed by being

covered with a whitish down; it has also a more rounded form. Other varieties of Santonica have also been noticed by writers; but the Levant Wormseed is now the only one ordinarily found in commerce.

Medical Properties and Uses.—Santonica and santonin possess anthelmintic properties, more especially the latter, which is the form in which the drug is now generally administered. The effects of santonin are more especially manifest upon the round-worm (*Ascaris lumbricoides*), which it is said by Küchenmeister to kill more rapidly than any other anthelmintic. It is useless against the tapeworm, and probably also the threadworm (*Oxyuris* (*Ascaris*) *vermicularis*); although many regard it as an effectual remedy against the latter. Its administration should be followed in a few hours by a mild purgative. Santonin is well adapted for children on account of the smallness of the dose required, and from its being without taste or odour. Besides its use as an anthelmintic, it has been recommended as a substitute for quinia in intermittent fevers, but with no satisfactory results. In some persons the use of santonin has been followed by xanthopsy or yellow vision, so that red colours become orange, and blue green; an effect which may last for several hours. This singular action has caused the employment of santonin in amaurosis and some other diseases of the eye, but without any marked benefit. In large doses santonin acts as a poison, causing giddiness, headache, vomiting, convulsions, and even death. In such cases, Professor Binz of Bonn, has recommended the inhalation of chloroform or ether as the most effectual remedy; and also advises purgatives and plenty of drink to be given for the elimination of the drug. Santonica is but little used in the United States, having been superseded by the seeds of *Chenopodium anthelminticum*, which are there universally known under the name of wormseed. These seeds are described by us under the name of the plant from which they are derived.

Per. Mat. Med., by B. & R., p. 686; Pharmacographia, p. 346; U. S. Disp., by W. & B., pp. 773 and 1390; Garr., Mat. Med., p. 293; Stille's Therapeutics and Mat. Med., vol. ii, p. 341; Willkomm, in Botanische Zeitung, 1872, p. 130; Mialhe, in

Pharm. Journ., vol. iii, 1st ser., p. 356; Sestini, in Amer. Journ. Pharm., Nov., 1864, p. 527, and in Chem. News, Aug. 11, 1865, p. 61; Journ. de Pharm., Aug., 1863, p. 161; Binz, in Pharm. Journ., vol. vi, 3rd ser., p. 967; Cannizzaro and Sestini, in L'Union Pharmaceutique, vol. xvii, p. 136.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected by Karelin and Kiriloff in the Soongoro-Kirghiz Desert (no. 789).

1. A plant with the flower-heads unopened.
2. A flower-head.
3. Vertical section of the same.
4. Scales of the involucre.

(2–4 enlarged.)

D.Blair ad sicc. del. et lith.

M&N Hanhart. ir

STRYCHNOS NUX-VOMICA, *Linn.*

N. Ord. LOGANIACEÆ. Lindl., Veg. K., p. 602; Le Maout & Dec., p. 555.

Tribe *Loganieæ*.

Genus **Strychnos**,* *Linn.* B. & H., Gen., ii, p. 797. Species about 60, widely spread through the tropics of both old and new worlds.

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178. Strychnos Nux-vomica,† *Linn., Sp. Plant., ed.* 1, *p.* 189 (1753).

Nux-vomica. Poison-nut. Kuchila (Bengal).

Syn.—S. colubrina, *Wight.* S. ligustrina, *Blume?*

Figures.—Woodville, t. 79; Roxburgh, Pl. Coromandel, i, t. 4, cop. in Hayne, i, t. 17; Steph. & Ch., t. 52; Nees, t. 209; Berg & Sch., t. 136; Wight, Ic., t. 434; Beddome, Fl. Sylvat., t. 242.

Description.—A moderate-sized tree, with a short thick trunk and irregular branches covered with a yellowish-grey nearly smooth bark, branchlets much thickened at the nodes by the persistent leaf-bases, dichotomous. Leaves opposite, without stipules, shortly stalked, 2—4 inches long, oval-rotundate, rounded or somewhat tapering at the base, acute at the apex, entire, smooth and shining on both sides, 3- or 5-nerved from the base, but only the midrib reaching the apex. Flowers laxly arranged in small trichotomous paniculate cymes at the ends of the branches; the central flowers sessile, the lateral shortly stalked, pedicels downy. Calyx small, with 5 shallow, acute, teeth, downy outside, persistent, thick. Corolla over $\frac{1}{4}$ inch long, funnel-shaped, with 5 short, valvate-induplicate, oblong-lanceolate, blunt segments, rather fleshy, smooth outside, densely hairy for the lower $\frac{2}{3}$ of the tube within, greenish-white. Stamens 5, inserted in the throat of the corolla and alternate with its lobes, filaments excessively short, anthers oblong, dorsifixed, 2-celled. Ovary small, 2-celled, with numerous

* *Strychnos* from the Greek στρύχνον, equivalent to the Latin *Solanum*, was used for several poisonous plants, but not for the present one.

† *Nux vomica* was the name of the drug in the shops as early as the 16th century.

ovules in each cell in several rows on the axile placentas. Style filiform, a little longer than the corolla, stigma capitate, faintly bifid. Fruit a smooth, shining, globular berry, as large as an apple, varying from 1¼ to over 2 inches in diameter, rind tough or somewhat hard, thin, bright orange-yellow, when ripe completely filled by a soft white gelatinous pulp in which the seeds are irregularly immersed, and which is traversed by the fibrous remains of the dissepiment. Seeds several, usually 1—5, circular, nearly flat, about 1 inch in diameter and nearly ¼ inch thick, slightly hollowed in the central part of the dorsal surface, somewhat convex on the ventral, margin rounded and narrowly keeled; testa blackish-, yellowish-, or whitish-grey, very densely covered with fine short, adpressed, whitish silky hairs, radiating from the centre, hilum, central prominent, raphe slightly raised, passing to a slight prominence in the margin; embryo ⅜ inch long, lying at the edge of the seed in a broad chink of the horny endosperm which readily splits into two halves, radicle thick, club-shaped, cotyledons cordate-ovate, acute.

Habitat.—This tree is common in many parts of Southern India, as the Malabar and Coromandel coasts; it also grows in Ceylon and in Burmah, Cochin-China, Timor, and Java, and even extends to N. Australia, if *S. lucida*, R. Br., be properly referred to the same species. It flowers in the cold season.

Plants are still cultivated in our botanic gardens, the tree having been first brought here in 1778 by Dr. P. Russell.

DC. Prod., ix, p. 15; Roxb., Fl. Ind., i, p. 575; Benth., Fl. Austral., iv, p. 369; Lindl., Fl. Med., p. 528.

Official Parts and Names.—1. Nux Vomica; the seeds: 2. Strychnia; an alkaloid prepared from Nux Vomica (B. P.). The seed (*Nux Vomica*) (I. P.). Nux Vomica; the seed (U. S. P.).

1. Nux Vomica.—*Commerce.*—Nux vomica is imported into Great Britain and other parts of the world, from the East Indies. There are no recent returns of the quantity imported into this country, but judging from those of a few years since, the amount

Other Products of the Nux Vomica Plant.—Nux vomica bark has been substituted for Cusparia or Angustura Bark, as is described under *Galipea Cusparia;* it has therefore been termed *false angustura bark.* It is likewise known in Calcutta under the name of *Rohun;* from which circumstance it is also sometimes substituted for the comparatively harmless bark of *Soymida febrifuga,* which, as is stated in our notice of this plant, is also known by the same native name. Waring says, that nux vomica bark forms the principal ingredient in the chief of the medicated oils in common use by the natives of India as local applications to leprous, syphilitic, and other obstinate eruptions.

In some parts of India, the wood of the Nux Vomica plant, under the native names of *Goagurree* and *Kajra che lakor,* is largely used as a domestic medicine; and its efficacy is supposed to be much increased by the addition of a piece of the kernel of the coco-de-mer (*Lodoicea seychellarum*). A decoction of the leaves is also used as an external application in rheumatism.

Steph. & Church., Med. Bot., by Burnett, pl. 52; Per. Mat. Med., vol. ii, pt. 1, pp. 636 and 640; Per. Mat. Med., by B. & R., p. 647; Pharmacographia, p. 384; U. S. Disp., by W. & B., pp. 575 and 1415; Garr., Mat. Med., p. 308; Royle's Mat. Med., by J. Harley, p. 515; Pharm. of India, by Waring, p. 145; Gmelin's Chem., vol. xvii (1866), p. 589; Watts' Dict. Chem., vol. iii, p. 243; Pharm. Journ., vol. xviii, 1st ser., p. 432, and Dymock, in vol. vii, 3rd ser., p. 109; Year Book of Pharmacy, for 1875, pp. 289 and 306.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected on the Coromandel Coast; the fruit from a specimen in the Museum of the Pharmaceutical Society.

1. A branch with leaves and flowers.
2. Corolla opened.
3. Calyx and pistil.
4. Vertical, and—5. Transverse section of the ovary.
6. Fruit.
7. Section of the same.
8, 9. Seed.
10. Section of the same.

(2–5 enlarged.)

tetanic spasms. Strychnia has no direct influence on the heart, the voluntary muscles, the cerebral centres, or motor nerves. Thus, when given to man in sufficient doses, it causes twitching and rigidity of the muscles, succeeded by tetanic spasms, but without loss of consciousness; and in the intervals between the paroxysms the muscles become relaxed The fatal effects of excessive doses of strychnia have been counteracted by chloroform, chloral hydrate, calabar bean, conium, and monobromated camphor. The experiments of Crum Brown, Frazer, and Schroff show that the methyl and ethyl compounds of strychnia have an action directly the reverse of that of strychnia itself, for instead of producing tetanic spasms like it, they induce a condition of general paralysis of the body by paralysing the extremities of the motor nerves, like curare or conium. Nux vomica and strychnia possess valuable nervine tonic and stimulant properties. They have been found of especial value in the treatment of paralysis, but more especially in that form which results from lead poisoning; also in neuralgia, chorea, aphonia, impotence, constipation arising from torpor of the colon, incontinence of urine, spermatorrhœa, debilitated states of the system succeeding exhaustive illnesses, such as rheumatic fever, in atonic diarrhœa and chronic dysentery, and in prolapsus of the rectum, pyrosis, amaurosis, epilepsy, and other affections. There is no doubt that the preparations of nux vomica are especially valuable in the atonic complaints so common in India and other hot countries. On account of their powerful properties all the preparations of nux vomica should be used cautiously, and their effects carefully watched.

In consequence of the large importations of late years of nux vomica, it was thought by many persons, that the seeds were employed in the manufacture of bitter ale on account of their intense bitterness, but although this has been disproved, it is still unknown for what purposes they are so largely required, their consumption in medicine being comparatively limited. A large quantity of both nux vomica and strychnia are, however, employed by gamekeepers, &c., to destroy vermin, &c. Both nux vomica and strychnia are also used to some extent in veterinary practice.

cannot annually be less than 6000 cwt. This is about half of the whole quantity exported from British India. The imports of Nux Vomica into this country have enormously increased of late years, as may be judged of by the fact that, in the years 1838, 1839, and 1840, duty was only paid on an annual average of 680 lbs.

General Characters and Composition.—The seeds, which are commonly known under the official name of *Nux Vomica*, as seen in commerce, are nearly round in form, and on an average, about seven-eighths of an inch in diameter, by nearly a quarter of an inch in thickness; they are nearly flat on both surfaces, or more commonly, slightly convex on one surface, and concave on the other, and marked in the centre of the latter surface by a roundish scar or hilum, from which a more or less projecting line or raphe is seen to pass to the circumference, where it terminates in a slight prominence. In some cases the seeds are more or less curved or irregularly twisted so as to modify in some degree the above characters. The testa or seed-coat is of an ash-grey or yellowish-grey-green colour, and has a glistening appearance from being thickly covered with short satiny hairs. The seeds are very hard and horny, without any perceptible odour, but having an extremely bitter taste. They are powdered with difficulty, and the powder has a yellowish-grey colour. By the Germans they have been named *Krähenaugen* or *Crows' eyes*, from their being poisonous to crows, and their fancied resemblance to grey eyes.

Nux Vomica contains three crystalline alkaloids, namely, *strychnia*, *brucia*, and *igasuria*, all of which have a bitter taste and poisonous properties; but by far the most important in a medicinal point of view, is the alkaloid strychnia, which, being official, is described below. All these alkaloids are said to be combined with a peculiar acid, termed *strychnia* or *igasuric acid*, and which, according to Ludwig, is a yellowish-brown amorphous mass, with a sour astringent taste, and a strongly acid reaction. *Igasuria* is said by Schützenberger, to be composed of nine distinct bases, differing from each other in their solubility in water, in composition, and in other characters; it requires further examina-

tion. *Brucia* is obtainable from nux vomica in proportions, which have been variously estimated at from 0·12 to 1·01 per cent. It very much resembles strychnia in its bitter taste and poisonous properties, &c., and like it forms crystalline salts; but neither it nor its salts are so powerful as strychnia and its compounds. According to Andral, brucia is only about one twelfth of the strength of strychnia. It differs from strychnia in its far greater solubility in water, being dissolved in about 150 parts of boiling water; and by acquiring, as well as its salts, an arterial blood-red colour when moistened with concentrated nitric acid. The other constituents of nux-vomica are of little importance.

2. Strychnia or Strychnine.—This is contained in nux vomica in proportions varying from $\frac{1}{4}$ to $\frac{1}{2}$ per cent. We have been informed on reliable authority, that the Bombay nux vomica of commerce, contains a much larger proportion of strychnia than Madras nux vomica; it is important, therefore, that in so powerful a medicine as nux vomica, a full chemical examination should be made of the seeds of different districts, and the results published. Strychnia occurs in right square octahedrons or prisms, colourless and inodorous, soluble in about 6700 parts of cold, or 2500 parts of boiling water. It is so intensely bitter that when one part of the alkaloid is dissolved in 600,000 parts of water, this taste is perceptible. It is soluble in chloroform, and in boiling rectified spirit; but very sparingly so in absolute alcohol, benzol, or ether. It is not coloured by nitric acid; and when burned with free access of air it leaves no ash. Pure sulphuric acid forms with it a colourless solution, which on the addition of bichromate of potash acquires an intensely violet hue, speedily passing through red to yellow. It is a very active poison; and when a few drops of a solution containing only $\frac{1}{3000}$ of a grain is placed in contact with the skin of a frog, it causes tetanic spasms in less than half an hour.

Medical Properties and Uses.—The action of nux vomica is essentially due to its alkaloid strychnia, which so increases the reflex excitability of the spinal cord that the slightest stimulus, such as a sudden noise, a touch, or even a breath of air, causes

DBlair ad nat. del. et lith.

M & N Hanhart

DELPHINIUM STAPHISAGRIA, *Linn.*

N. Ord. RANUNCULACEÆ.

Tribe *Helleboreæ*.

Genus Delphinium,* *Linn.* B. & H., Gen., i, p. 9; Baill., Hist. Pl., i, p. 80. Species about 50, natives of the north temperate regions of both old and new worlds.

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4. Delphinium Staphisagria,† *Linn., Sp. Plant., ed.* 1, *p.* 531 (1753).

Stavesacre.

Syn.—Staphisagria macrocarpa, *Spach.*

Figures.—Woodville, t. 154 (*D. pictum*, DC.); Flora Græca, t. 508, cop. in Steph. & Ch., t. 55; Nees, t. 394; Reichenb., Ic. Fl. Germ., iv, t. 69; Baill., Hist., i, figs. 53–58.

Description.—An annual (or biennial ?) herb, with a large tapering root, and a stout, erect, cylindrical, slightly branched stem reaching 3 or 4 feet in height, very finely downy and densely covered with long soft spreading hairs. Leaves alternate, on long hairy stalks, palmately veined, the lower ones roundish, 4 or 5 inches in diameter, cut into 7—9, equal, broad, overlapping lobes which are trifid with acute segments, the upper ones more deeply divided into 5—7, oval or lanceolate, blunt or acute, entire or slightly lobed segments, pubescent or nearly smooth above, hairy on the veins beneath, bright green. Flowers large, on long stout very hairy stalks in the axils of leafy bracts, and with 2 smaller opposite bracts at the base of each pedicel, arranged in long lax racemes or panicles at the ends of the stem and branches. Sepals 5, petaloid, irregular, spreading, very hairy outside, glabrous within, purplish-blue, veined, the posterior one ovate provided at the base with a short, blunt, faintly 2-lobed, hollow spur projecting backward, the two

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* *Delphinium*, from the resemblance of the unopened flowers to the head of a dolphin (*delphin*) as formerly represented by artists.

† *Staphisagria*, *σταφὶς ἀγρία*, the ancient Greek name, *herba pedicularis* of the Romans; from its use. The English Stavesacre is of course a corruption.

anterior broadly oval, blunt. Petals usually 4, the two posterior narrowly oblong, erect, connected below, each prolonged at the base behind into a thick hard tapering spur projecting backward into the pouch of the posterior sepal, the two lateral wing-like, with a long claw and a dilated unilateral rounded limb somewhat crisped on the margin. Stamens numerous, hypogynous, filaments curved, dilated below, anthers yellow. Carpels 3, erect, tapering, covered with silky hairs, with few ovules in a double row, styles rather long, smooth, shortly bifid. Fruit of 3 thick, oblong, erect, hairy, veined follicles prolonged above on the outer side into a curved beak (the style) dehiscing by their ventral (inner) suture. Seeds about 12 in each follicle, densely packed and more or less flattened, about $\frac{1}{4}$ in. in their longest diameter, irregularly quadrilateral with sharp angles, testa thick, deeply netted and pitted, dark brown, embryo minute, embedded at the edge of the copious oily endosperm.

Habitat.—This species is found in the countries of the Mediterranean region, from Portugal and Spain to Greece and Crete, and also extends into Asia Minor and the Canary Islands, growing in dry bushy places and flowering in early summer. It is grown in most of our botanic gardens, and is cultivated for use in the South of France and Italy. Like some other species of the genus the flowers vary in colour, being sometimes pink, or pale blue; the whole plant has a somewhat unpleasant odour when handled. The seeds vary considerably in size.

Woodville's plate above quoted is referred by De Candolle to *D. pictum*, Willd., a plant chiefly known in gardens, but also found in Sardinia. Its differences being of a comparative nature seem scarcely sufficient to warrant its specific separation.

Bertolini, Fl. Ital., v, p. 413; Boiss., Fl. Orient., i, p. 94; Gren. and Godr., Fl. France, i, p. 49; DC., Syst. Veg., i, p. 363; Lindl., Fl. Med., p. 9.

Part Used and Name. — STAPHISAGRIÆ SEMINA; the seeds. Stavesacre seeds are not official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United

States; but they were formerly official in the London and Edinburgh Pharmacopœias.

General Characters and Composition.—Stavesacre seeds are imported from Nismes and other parts of the South of France, and also from Trieste. In form they are irregularly triangular or obscurely quadrangular, distinctly arched on one side, and in weight each averages a little over half a grain. The testa is of a blackish-brown colour when the seeds are freshly dried, but it becomes dull greyish-brown when they have been long kept; its surface is wrinkled and deeply pitted. When the somewhat brittle testa is removed the nucleus is found to be soft, whitish, and of an oily nature. Stavesacre seeds have no very marked odour, but a bitter nauseous taste, which is followed after they are chewed by a burning and tingling sensation.

The seeds are said to contain no less than three alkaloids, *delphinia*, *staphisaïne*, and *staphisagrine*; also a crystalline acid termed *delphinic acid*; a *fatty oil* in the proportion of about 26 per cent. and belonging to the non-drying class of oils; and other substances of no importance. But little is known of the properties of staphisaïne and staphisagrine; but staphisaïne is readily distinguished from delphinia by its insolubility in ether. The activity of stavesacre seeds would appear to be essentially due to *delphinia*. This alkaloid, which is also termed *delphinine*, and *delphine*, as usually found in commerce, is in very minute rhombohedric crystals, but larger crystals may be obtained; it freezes at 248°, and is soluble in ether, alcohol, and chloroform, but almost insoluble in water. Of *delphinic acid* nothing definite is known, but Hofschläger, its discoverer, described it as white, crystalline, volatile, and in small doses as a powerful emetic.

Medical Properties and Uses.—Stavesacre seeds possess emetic, purgative, and anthelmintic properties, and were formerly employed internally to produce such effects; but on account of their violent action they are no longer used. It would appear also that they have narcotic properties; indeed, they are used in some parts of the world to intoxicate fish in the same manner as Cocculus indicus. The powdered seeds have been used

externally from the earliest times for the destruction of *pediculi* on the head and other parts of the body, both in the human subject and in cattle; hence the German name *läusesamen*, signifying *louse-seeds*. They may also be employed for a like purpose in the form of an ointment or acetous infusion. An ointment made from the fatty oil of stavesacre seeds has been also highly recommended by Dr. Balmanno Squire in *prurigo senilis*, which is essentially due to the presence of pediculi. Stavesacre seeds have been also employed in eczema, psora, and other skin affections, both externally and internally; and a strong tincture has been used as a liniment in rheumatism and neuralgia.

Delphinia has been used both internally and externally, but it is a dangerous remedy for internal administration. Externally, however, in the form of ointment or tincture, it has been successfully used in neuralgic and rheumatic affections; but aconitia is generally regarded as far more useful in similar cases, and has almost entirely superseded the use of delphinia in regular practice.

Per. Mat. Med., by B. & R., p. 996; Pharmacographia, p. 5; U. S. Disp., by W. & B., p. 1699; Watts' Dict. Chem., vol. ii, p. 310; Turnbull on the Medical Properties of the Ranunculaceæ, pp. 114–118; Journ. de Pharm., vol. xix, p. 519; Ann. de Chim. et de Phys., vol. l, p. 2; Balmanno Squire, in Pharm. Journ., vol. vi, 2nd ser., p. 405.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Garden of the Apothecaries' Company, Chelsea.

1. Portion of the main stem with fruit, and a lateral branch with flowers.
2. Sepals separated.
3. Vertical section of flower.
4. The two posterior petals.
5. A lateral petal.
6. A stamen.
7. Summit of style.
8, 9. Seeds.
10. Section of a seed.

(4–7, 9, 10 enlarged.)

Delphinium Consolida, *Linn.*

Larkspur.

Official Part and Name.—DELPHINIUM, *Larkspur;* the seed of Delphinium Consolida (U. S. P. *Secondary*). In the last U. S. P. the root was official, but it is not mentioned in the present issue. No part of the plant is official in the British Pharmacopœia, or the Pharmacopœia of India. This plant, which was introduced from Europe, has now become naturalised in some parts of the United States. Its specific name is derived from the power its flowers were formerly supposed to possess of healing or consolidating wounds.

General Characters, Composition, Medical Properties, and Uses.—The seeds have a very acrid and somewhat bitter taste, and have been found by Mr. Hopkins, of Baltimore, to contain *delphinia* as their essential constituent; and also amongst other substances a *volatile oil, fixed oil,* and *resin. Aconitic acid* has likewise been obtained from the expressed juice of the plant.

The seeds possess diuretic properties, and in large doses cause vomiting and purging. In the form of a tincture, made by macerating an ounce of the seeds in sixteen fluid ounces of proof spirit, and given in doses of ten drops, gradually increased, it has been found useful in spasmodic asthma and dropsy. The properties and uses of this plant are probably closely analogous to those of *Delphinium Staphisagria.*

U. S. Disp., by W. & B., p. 359; Wicke, Journ. de Pharm., Juillet, 1854, p. 79, and in Pharm. Journ., vol. xiv, 1st ser., p. 278; Hopkins, in Amer. Journ. of Pharm., vol. xi, p. 8.

D.Blair, ad nat. del. et lith.

M&N.Hanhart

POTENTILLA TORMENTILLA, *Nestl.*

N. Ord. Rosaceæ.

Tribe *Potentilleæ*.

Genus Potentilla,* *Linn.* B. & H., Gen., i, p. 620; Baill., Hist. Pl., i, p. 466. Species about 150 or more, natives chiefly of the temperate and colder regions of the northern hemisphere.

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101. Potentilla Tormentilla,† *Stokes in Withering, Bot. Arr., ed. 2, p. 535 (1787).*

Tormentil.

Syn.—Tormentilla erecta, *Linn.* T. officinalis, *Curtis.* Potentilla sylvestris, *Necker.*

Figures.—Woodville, t. 181; Hayne, ii, t. 48; Steph. & Ch., i, t. 26; Nees, t. 309 (bad); Curt., Fl. Londin., fasc. 5; Syme, E. Bot., iii, t. 430.

Description.—A perennial herb. Rootstock short, nearly cylindrical, solid, about ½ inch or more in diameter, branched, truncate below, abruptly tapering above, giving off long cylindrical roots below, the upper part with reddish brown chaffy scales; dark brown externally, bright blood-red in the centre. Stems numerous, from the axils of the chaffy scales, very slender, cylindrical, 1 foot or more long, widely spreading or prostrate, pale-green or reddish, shortly hairy, much branched in the upper part. Leaves alternate and shortly stalked below, usually opposite and nearly or quite sessile above, all with lanceolate or oval, entire or palmately toothed stipules, trifoliate, leaflets small, sessile, obovate- or lanceolate-wedge-shaped, entire and tapering below, with a few large teeth above, hairy on both surfaces, silky on the veins beneath, dark green, paler below. Flowers small, scarcely ½ inch wide, on long slender stalks terminating the stems and

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* *Potentilla*, the name of the Silverweed (*P. Anserina*, L.) in the 16th century; from its supposed powerful virtues.

† *Tormentilla*, a pharmaceutical name of the middle ages; from having been employed to relieve the pain (*tormentum*) of toothache, or that of dysentery (*tormina*).

branches (the lower ones apparently coming off opposite the alternate leaves), which repeatedly dichotomise at the opposite leaves, the whole forming a very lax divaricate cyme. Calyx very deeply cut into 4 lanceolate, acute, pale green, hairy, valvate segments, outside of which and alternating with them are 4 other ones about half as long (epicalyx). Petals 4, roundish, with a very short claw, spreading, lemon yellow with the base orange, soon falling. Stamens about 16, inserted on the perigynous rim (disk) of the calyx which is covered with white hairs, filaments slender, shorter than the petals, yellow, anthers short, rounded. Carpels few, about 6—8, distinct; ovary small, tumid, glabrous; styles lateral, erect, yellow, thickened above. Achenia somewhat kidney-shaped, keeled on the back, smooth, brown, with ridged reticulation when dry. Seed solitary, pendulous, radicle superior, no endosperm.

Habitat.—A very common plant in all parts of this country, especially on heaths, dry fields, roadsides and woods, flowering from July till late in the autumn. It is also found throughout the continent of Europe and extends into the arctic regions, Siberia and Iceland, but does not reach N. America. There are several larger varieties with rooting stems, stalked leaves, and sometimes 5 petals, which appear to be intermediate between this species and *P. reptans*, Linn., the common Cinquefoil.

Syme, E. B., iii, p. 146; Hook. f., Stud. Flora, p. 115; Watson, Comp. Cyb. Br., p. 159; Willk. & Lange., Prod. Fl. Hisp., ii, p. 233; Gren. & Godr., Fl. France, i, p. 530; Boiss., ii, p. 717; Lindl., Fl. Med., p. 225.

Official Part and Name.—TORMENTILLA, *Tormentil;* the rhizome (U. S. P. *Secondary*). It is not official in the British Pharmacopœia, or the Pharmacopœia of India; but it was formerly official in the London, Edinburgh, and Dublin Pharmacopœias.

General Characters and Composition.—Tormentilla rhizome is commonly known in this country as tormentilla root, and in the United States, as *tormentil*. As seen in commerce in a dried state it has usually an irregularly cylindrical form, but is some-

times twisted or more or less branched or tuberculated; it is from one to two inches in length, half an inch or more thick, and gives off below a variable number of small rootlets. It has a dark reddish- or blackish-brown colour externally, and a reddish or flesh-red colour internally; it has no odour, but a very astringent taste.

The principal constituent of tormentil is *tannic acid* in the proportion when dried of nearly 18 per cent.: it also contains, according to Rembold, *kinovic acid;* about 16 per cent. of substance called *tormentil-red,* the red colouring matter of the drug, and having the same composition as rhatany red; and other unimportant constituents. An infusion of tormentil acquires a blackish-green colour on the addition of a persalt of iron. Its properties are essentially due to tannic acid. Boiling water readily extracts its virtues.

Medical Properties and Uses.—Tormentil has long been known as a popular remedy in diarrhœa. It possesses powerful astringent properties; but at present is but seldom prescribed by the regular practitioner, its place being supplied by astringents of foreign origin, such as rhatany, catechu, and kino. We believe it, however, to be one of the best of vegetable astringents, and applicable in all diseases in which this class of medicines is indicated. In the form of decoction it is a valuable internal remedy in diarrhœa and chronic dysentery; a useful wash or gargle in spongy gums and ulceration of the mouth or tongue; and a good astringent injection in atonic leucorrhœa. It is also said to be very efficacious in the dysenteries of cattle.

Tormentil is also used (or was so till very recently) in the Orkney and Faröe islands for tanning; and in Lapland in the preparation of a red dye.

Steph. & Church., Med. Bot., by Burnett, pl. 26; Per. Mat. Med., by B. & R., p. 817; U. S. Disp., by W. & B., p. 868; Amer. Journ. Pharm., July, 1868, p. 311; Ann. der Chem. und Pharm., vol. cxliv, p. 5; Adams, in Pharm. Journ., vol. vi, 2nd ser., pp. 158 and 260; Maisch, in Amer. Journ. of Pharm., March, 1875, p. 109, and Pharm. Journ., vol. v, 3rd ser., p. 986.

DESCRIPTION OF PLATE.

Drawn from a plant collected at Barnes, Surrey.

1. Upper part of flowering stem.
2. Rootstock.
3. A flower.
4. Vertical section of the same, the petals removed.
5. A carpel.
6. Back, and—7. Side view of achene.
8. Section of the same.

(3–8 enlarged.)

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N. Ord. CUCURBITACEÆ.

Tribe *Cucumerineæ*.

Genus Ecballium,* *Rich.* B. & H., Gen., i, p. 826. The following is the only species.

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115. Ecballium Elaterium,† *A. Rich., Dict. Class. d'Hist. Nat.*, vi, *p.* 19 (1825).

Squirting Cucumber. Wild Cucumber.

Syn.—Momordica Elaterium, *Linn.* Ecbalium agreste, *Reichenb.* Ecballium officinale, *N. & E.* Elaterium cordifolium, *Moench.*

Figures.—Woodville, t. 72; Hayne, viii, t. 45; Steph. & Ch., i, t. 34; Nees, t. 272; Bot. Mag., t. 1914; Flor. Græca, t. 939; Reich., Ic. Fl. Germ., xix, t. 1619.

Description.—A small perennial herb, with a fleshy, tapering, white root. Stems prostrate or trailing, ½ to 3 feet long, branched, thick, succulent and translucent, cylindrical, slightly furrowed, set with scattered short, thick, stiff, projecting hairs or bristles. Leaves alternate, without stipules or tendrils, on very long, thick, succulent, tapering petioles, hispid with bristles like those of the stem; blade 3—5 inches long, bluntly triangular in outline, deeply cordate with square or rounded auricles at the base, blunt at the apex, coarsely and irregularly toothed or lobed and undulated at the margin, pale green and with few scattered tubercled hairs above, more or less white with dense woolly hairs beneath. Flowers unisexual, monœcious, rather large, stalked, the male flowers usually several together on a common axillary peduncle, the female usually solitary, occasionally accompanying the male flowers. Calyx deeply divided into 5 narrow, acute segments, hispid with long white bristly hairs, in the male flowers with a very short tube, in the female superior, the tube fused with the ovary. Corolla gamopetalous, with a very short tube and 5 widely

* Name from ἐκβάλλω, to throw out, from the action of the fruit. Richard spells it *Ecbalium*, but the above must be more correct.

† From ἐλατήριον, purging, the name of the drug in classical times.

spreading, equal, ovate-oblong, acute segments, slightly hairy inside, sulphur-yellow veined with pale green. Male flowers:—Stamens 3, inserted on the base of the corolla, filaments short, hairy, anthers with an expanded, flattened and crumpled connective, one 1-celled, the others 2-celled, the cells elongated, placed along the edge of the dilated connective; no pistil. Female flowers:—Stamens absent or represented by 3 sterile filaments; ovary inferior, ovoid, fleshy, 1-celled, with 3 large fleshy parietal placentas filling up this cavity (and making it look 3-celled), with numerous stalked horizontal ovules in a row along either side; styles 3, somewhat connected below, green, bifid above, and with a large papillose stigma on the outer side of the branches. Fruit pendulous or nodding from the recurved tip of the elongated, gradually tapering, slightly hispid, succulent stalk, oblong-ovoid, rounded at the base, more acute at the apex where it is capped by the withered flower, $1\frac{1}{2}$ to $2\frac{1}{4}$ inches long, fleshy, firm, pale yellowish-green, covered with short, pale, succulent papillæ terminating in hair-like points, pericarp thick, white within, filled with a watery juice in which the seeds are immersed, when ripe separating from the stalk suddenly, and violently expelling the juice and seeds through the orifice thus formed; after this phenomenon the fruit becomes narrower and hollow, the cavity being lined with soft green pulp. Seeds numerous, closely packed, but loose in the watery pulp, oblong-ovoid, slightly compressed and keeled, smooth and polished, bright pale brown, testa thin, brittle, with a thin layer of soft tissue externally, inner coat very thin and membranous; embryo large, white, cotyledons plane-convex, radicle at the hilum, short, broad, pointed; no endosperm.

Habitat.—A common weed in waste places in the South of Europe, throughout the Mediterranean district and reaching as far to the east as Persia. It was very early cultivated in gardens in this country (before 1568), and is now grown in small quantity for use at Mitcham and Hitchin.

The singular mode of expelling the seeds (from which the plant has its name) is explained by the engorgement of the central pulp of the fruit by fluid which passes into it by osmosis from the

outer part of the pericarp through its contractile inner portion; the resulting tension at length becomes so great that the wall gives way at the point of least resistance, which is where the fruit is united to its stalk. The seeds are thrown out with great force and to a considerable distance.

If placed in water the outer covering of the seeds swells up into a large mass of semi-transparent jelly; the structure of the superficial cells which undergo this change is described and figured by Du Tailly in the paper quoted below.

Gren. & Godr., i, p. 604; Boiss., Fl. Orient., ii, p. 760; Lindl., Fl. Med., p. 86; Du Tailly, in Adansonia, x, p. 208, t. 8, 9.

Official Parts and Names.—1. Ecbalii Fructus; the fruit, very nearly ripe, of the Squirting Cucumber, Ecbalium officinarum, *Richard:* 2. Elaterium; a sediment from the juice of the Squirting Cucumber (B. P.). The sediment from the expressed juice of the fruit (*Elaterium*) (I. P.). Elaterium; a substance deposited by the juice of the fruit of Momordica Elaterium (U. S. P.).

1. Ecbalii Fructus.—The fruit is directed in the British Pharmacopœia to be obtained when very nearly ripe, because if left till it is quite ripe, it separates spontaneously from its peduncle, and at the same time the seeds and juice are expelled with violence from the aperture left by the detached stalk; it is from this circumstance that its common name of Squirting Cucumber is derived. It is advisable, therefore, that the stalk should be attached to the fruit when it is used; otherwise the pericarp may have burst and expelled the contained juice.

2. Elaterium.—*Preparation.* Dr Clutterbuck proved many years since, that the active substance—elaterium—is principally contained in the juice around the seeds, the remainder of the fruit being comparatively inert. As this juice is more liquid than any other part of the fruit it alone runs out to any extent, when the fruits are simply sliced, and therefore Dr. Clutterbuck's experiments have shown that the finest elaterium is obtained without pressure from the fruits when as nearly ripe as possible.

But in practice some pressure must be employed; because the fruits must not be too ripe when gathered, otherwise they are apt to burst either at that time or when carried away; and in this imperfectly ripe state the juice does not readily flow from them until lightly pressed. The process ordered for the preparation of Elaterium in the British Pharmacopœia is founded upon these principles, and is as follows:—"Cut the fruit lengthwise, and lightly press out the juice. Strain it through a hair sieve; and set it aside to deposit. Carefully pour off the supernatant liquor; pour the sediment on a linen filter; and dry it on porous tiles with a gentle heat. The decanted fluid may deposit a second portion of sediment, which can be dried in the same way." The amount of elaterium obtained will vary very much according to the mode of preparation. Thus, by operating on the fruits without pressure, forty cucumbers, as the fruits are commonly termed, only yielded Dr Clutterbuck six grains of elaterium; but by using slight pressure, the average quantity of elaterium obtainable is about half an ounce from a bushel or forty pounds of the fruits. If greater pressure be employed a larger quantity may be obtained, but the product is deteriorated in quality in proportion to the amount of force used in expressing the juice. It seems, however, certain that in very warm dry seasons the produce is larger than just mentioned, for in the very fine summer of 1868, 240 lbs. of fruits gathered at Mitcham, according to Hanbury, yielded $4\frac{5}{8}$ ounces of elaterium = 0·123 per cent.

No directions are given for the preparation of elaterium in the United States Pharmacopœia, the plant not being, at present, cultivated to any extent in that country, hence the official elaterium is understood to be that found in commerce, and which is principally obtained from England, although to some extent also, of late years, from Malta.

General Characters, Varieties, and Composition.—Elaterium when of good quality occurs in light, friable, opaque, flat or very slightly curved cakes, about $\frac{1}{10}$ of an inch thick; these are frequently marked on one of their surfaces by the impression of the paper, linen, or muslin, on which they were dried. Elaterium has a pale green

colour when fresh, but by keeping it becomes greyish-green, and ultimately of a yellowish-grey or drab colour. Some pieces, after being kept for years, acquire a sparkling appearance externally, from the presence of very minute crystals. Elaterium has a finely granular fracture; an acrid and bitter taste; and a faint tea-like odour. It does not effervesce with acids; a cooled deccotion is not perceptibly affected, or but very slightly so, by the addition of a solution of iodine; it yields half its weight to boiling rectified spirit, and this solution concentrated and added to warm solution of potash, yields on cooling not less than twenty per cent. of colourless crystals of elaterine, its acitve principle. Inferior kinds of elaterium are usually darker coloured, harder, more curled, and break with difficulty or with a close resinous fracture. The above remarks especially apply to English Elaterium, but this drug is also imported from Malta, and is then known in commerce as *Maltese Elaterium*. This kind is commonly in larger flakes or cakes, and of a paler colour than that prepared in England. It is also frequently mixed with starch or chalk, or with both these substances; hence such specimens either effervesce with dilute hydrochloric acid, or a cooled decoction becomes blue with solution of iodine, or both these reactions may take place, neither of which, as already seen, occur with the best English Elaterium. As a general rule, Maltese elaterium is inferior to English, although it may be occasionally found of good quality.

The active constituent of elaterium is *elaterine* or *elaterin* (the *ecbalin* of Williams). This is best obtained, according to Flückiger and Hanbury, by exhausting the drug with chloroform, and adding ether to the solution when it forms a crystalline deposit of elaterine, which should be purified by further washing with a little ether and recrystallizing from chloroform. In this way they obtained 33·6 per cent. of elaterine from the best English Elaterium and 27·6 from the Maltese kind. Good commercial elaterium ordinarily yields from 20 to 30 per cent. of elaterine. Elaterine crystallizes in colourless hexagonal scales or prisms; it is readily soluble in chloroform or boiling alcohol, and is insoluble in water

or ether; its alcoholic solutions are neutral; and it has an extremely bitter and slightly acrid taste. The experiments of Williams prove that when the fruits are exhausted of the free juice from which elaterium is obtained, they contain little if any elaterine; and Köhler found that the percentage of elaterine, even in the free juice of the fruits, gradually diminished as the season advanced, so that in September he was unable to obtain any amount of it whatever. It has also been clearly demonstrated that hot dry weather is favorable to the development of elaterine, and hence elaterium is most powerful when produced in very fine summers. From these circumstances therefore, as well as from its different modes of preparation already noticed, we have frequent causes which produce the varying strength of the drug. According to Walz, elaterium also contains a second crystallizable bitter principle, and three amorphous substances. The first principle he found to be a glucoside, to which he gave the name of *prophetin*: the others require further examination.

Medical Properties and Uses.—Elaterium is the most powerful hydragogue cathartic that is known, for when prepared by Clutterbuck, without pressure from the fruits, it purged violently in doses of one eighth of a grain; the usual dose of good commercial elaterium is from $\frac{1}{16}$ to $\frac{1}{2}$ a grain. Considering the varying strength of elaterium from season, climate, time, and mode of preparation, it would be desirable to substitute for it, or at least to introduce into use, its active and definite principle elaterine. The dose of elaterine could easily be regulated by mixing it previously with sugar of milk; or a solution of definite strength might be ordered in the pharmacopœia. Elaterium is a valuable remedy in dropsical affections, more especially when connected with disease of the heart. It is also a valuable remedy in renal dropsy. In cerebral affections, such as apoplexy, elaterium is also sometimes useful to relieve plethora and to prevent further effusion. Elaterium should be cautiously administered, as it sometimes causes nausea and great depression; and in improper doses it may produce violent gastro-enteritis and even death. When locally applied, elaterium acts as an irritant, as is proved by

the inflammation and ulceration of the fingers it sometimes produces in those employed in its preparation. The juice of the fruits has also produced violent inflammation in some cases by getting accidentally into the eyes of those engaged in their collection.

Per. Mat. Med., vol. ii, pt. 2, p. 219; Per. Mat. Med., by B. & R., p. 792; Pharmacographia, p. 260; U. S. Disp., by W. & B., p. 372; Gmelin's Chemistry, vol. xvii (1866), p. 365; Waring's Man. Pract. Therap., p. 299; Bell, in Pharm. Journ., vol. x, 1st ser., p. 168; Bentley, in Pharm. Journ., vol. i, 2nd ser., p. 323; Williams, in Chem. News, Feb. 18, 1860, p. 124; Power, in Amer. Journ. Pharm., Jan., 1875, p. 1, and in Pharm. Journ., vol. v, 3rd ser., p. 645.

DESCRIPTION OF PLATE.

Drawn from a plant in Kew Gardens, flowering in August.

1. End of a flowering stem.
2. A male flower.
3. Section of the same.
4. Anthers.
5. Section of a female flower.
6. Stigmas.
7. Section of the ovary.
8. Fruit.
9, 10. Seed.
11. Section of the same.

(4, 6, 10, 11 enlarged.)

L. Blair ad nat. del. et lith.

M&N Hanhart

CARUM CARUI *Linn*

N. Ord. UMBELLIFERÆ.

Tribe *Ammineæ*.

Genus Carum,* *Linn.* (amend.). B. & H., i, p. 890 (includes *Petroselinum, Ptychotis,* &c.). Species about 50, mostly natives of temperate and warm regions of the old world.

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121. Carum Carui,† *Linn., Sp. Plant., ed.* 1, *p.* 263 (1753).

Caraway.

Syn.—Bunium Carui, *Bieb.*

Figures.—Woodville, t. 41; Hayne, vii, t. 19; Steph. & Ch., t. 59; Nees, t. 276; Berg & Sch., t. 25 c; Syme, E. Bot., iv, t. 582 (bad); Reichenb., Ic. Fl. Germ., xxi, t. 1872; Nees, Gen. Fl. Germ.

Description.—Biennial (or annual), root tapering, brown, often branched below. Stem erect, slender, cylindrical, hollow, faintly striate, smooth, much branched, branches ascending. Root-leaves several, 6—9 inches long, on rather long petioles, narrowly triangular in outline, bi- or tri-pinnate, primary pinnæ sessile, opposite, closely placed so as to overlap at the base, broadly triangular in outline, ultimate divisions linear, acuminate, glabrous, pale green; stem-leaves alternate, small, with large sheathing scarious brown petioles, pinnate or bipinnate, the ultimate segments very narrow and pointed; at the base of the sheathing petiole on either side is a sessile pinnate stipule with filiform segments. Umbels numerous, long-stalked, often irregular, of about 8—10 slender rays, involucre of 1 or few filiform bracts, or wanting, partial involucres 0 or a single small bract. Flowers small, about $\frac{1}{10}$ inch across, the central ones usually barren. Calyx-tube obsolete. Petals broadly oval, notched, with an entire inflexed apex, white, stylopod conical. Fruit nearly $\frac{1}{8}$ inch long,

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* *Carum*, a form of *Careum*, in Greek κάρειον and κάρος, the classical name, but very doubtfully referable to this species.

† *Carui* was a name used by the mediæval pharmacists for the drug. Though it looks like a Latin genitive (as though for *carui semina*) it is said to be from the Arabian name *Karawya*. The English "Caraway" is clearly a further corruption of the same word.

oblong-ovoid, slightly compressed laterally, capped by the short spreading styles, smooth, scarcely constricted at the commissure which is flat, primary ridges prominent, narrow, blunt, pale, equal, vittæ large, one in each furrow, and two on the commissural face, dark brown, mericarps somewhat curved, readily separating from the bifid carpophore, and remaining suspended by their apex.

Habitat.—The Caraway plant has a somewhat peculiar distribution, and it is difficult to determine where it is native and where merely naturalised. It is a very common plant in the North of Europe and extends into Lapland, Finland, and Siberia, to within the arctic circle and to Iceland; in central Europe it is also widely distributed, but becomes scarce in the west, and scarcely occurs in the Mediterranean district or Asia Minor; it is, however, found in the Caucasus and the Western Himalaya. In Britain it is by no means uncommon in waste places, moist fields, &c., but is not considered to be native here by most writers; De Candolle, however, is inclined to believe it to be so. The plant is cultivated in this country in Essex and Kent, but much more largely in Holland, Prussia, and North Russia. A remarkable annual form is also grown in Morocco, which is described by Hanbury, who cultivated it, as having a stem 4 feet high, and also differing from the plant of Europe in its more divided foliage, more spreading umbels, larger flowers, shorter style, and more elongated and paler fruit.

Caraway flowers in its second year in June, and the fruit is ripe in July and August. The stipular auricles at the base of the petioles are worthy of remark in this usually exstipulate Order.

The authors of the "Genera Plantarum" make a section, *Carui*, of their large remodelled genus *Carum*, which beside the present plant includes about twelve European species.

Hook. f., Stud. Flora, p. 157; Syme, E. Bot., iv, p. 111; De Candolle, Géogr. Bot., p. 663; Watson, Comp. Cyb. Br., p. 519; Flück. & Hanb., Pharmacogr., p. 271; Koch, Fl. Germ., p. 246; Gren. & Godr., Fl. France, ii, p. 729; Ledebour, Fl. Ross., ii, p. 248; Willk. & Lange, Prod. Fl. Hisp., iii, p. 92; Boiss., Fl. Orient., ii, p. 879; Lindl., Fl. Med., p. 37.

Official Parts and Names.—1. Carui Fructus; the dried fruit: 2. Oleum Carui; the oil distilled in Britain from Caraway fruit (B. P.). The dried fruit (*Carui Fructus*) (I. P.). Carum; the fruit (U. S. P.).

1. Carui Fructus or Carum.—*General Characters, Varieties, and Composition.* Caraway fruits, or as they are commonly termed *caraways,* when seen in commerce, are usually separated into their two constituent parts or mericarps, which are ordinarily called *caraway seeds;* or in some cases, the mericarps are loosely attached to the central axis or carpophore of the fruit. These mericarps or half-fruits vary in length in the different commercial varieties from about $\frac{1}{6}$ of an inch in the English caraways to nearly $\frac{1}{3}$ of an inch in the Mogador kind; they are slightly arched, somewhat tapering at each end, and are marked with 5 fine pale-coloured longitudinal ridges, with intervening dark brown shining spaces, in each of which is a large and conspicuous vitta. Caraways have an agreeable aromatic odour; and a pleasant, somewhat sweetish, and spicy taste.

There are several commercial varieties of caraways; those commonly distinguished in this country being English, German, Dutch, and Mogador. Those used in the United States are either of home growth or imported from Europe. These varieties vary chiefly in length, plumpness, and colour; the English being shorter and plumper than the others, and of higher commercial value; the American are shorter than the German; and the Mogador are longer, paler coloured, and more stalky than the other varieties. Caraways are also exported from Finland, Russia, and other parts of the North of Europe.

The properties of caraway fruits depend entirely on a *volatile oil,* which is commonly known as *oil of caraway,* and is described below.

2. Oleum Carui (Oleum Cari, U. S. P.). *Oil of Caraway.*—Oil of Caraway is readily obtained by distillation of the fruits with water; the amount, however, varies a good deal in the different varieties of caraway; thus from about 3 to 6 per cent. ordinarily, but in some cases a larger quantity may be obtained. It is said

that those caraways which are derived from a northern or elevated locality yield the most oil. In this country the oil distilled from home-grown caraways is preferred, and is alone recognised in the British Pharmacopœia. Dutch oil is also regarded as better than that distilled in the southern parts of Germany. Oil of Caraway is nearly colourless or pale yellow when fresh, but it becomes darker yellow and even brown by keeping; it has the odour of the fruit, and a spicy, somewhat acrid taste. It is dextrogyrate; its specific gravity has been variously given at from 0·916 to 0·946. Some recent experiments of Dragendorff render it probable that oil of caraway, unlike volatile oils, as a general rule, may in some cases at least, become more soluble in alcohol by keeping. The experiments of Schweizer and Völckel show that oil of caraway is a mixture of two liquid oils, called *carvol* and *carvene*, which have different boiling points, and are separable by distillation; these two oils exist in the proportion of about $\frac{2}{3}$ of the former to $\frac{1}{3}$ of the latter. Carvene is a hydrocarbon; but carvol is an oxidised oil which is isomeric according to Gladstone, with the menthol or oxidised oil of spearmint, the myristicol of nutmegs, and the carvol of DILL FRUIT; it is also isomeric with the thymol of oil of thyme. The oily liquid called *carvacrol* is formed by the action of hydrated phosphoric acid on oil of caraway and some other substances.

Medical Properties and Uses.—Both the fruit and oil possess aromatic, stimulant, and stomachic properties. The fruit is often used to relieve the flatulent colic of children, &c.; but more frequently as an adjunct to other medicines as a corrective or flavouring agent. Oil of caraway is also employed for similar purposes; it is frequently added to purgative medicines to prevent griping. Caraway fruits are also used in veterinary practice for similar purposes. The oily liquid termed *carvacrol* is said to give immediate relief in toothache, when inserted into the cavity of a decayed tooth.

Oil of Caraway is also largely used in this country in perfumery, more especially in scenting soap; and the powdered fruits are "well adapted for mixing to form sachet powder."

The more important consumption of caraways is, however, as a spice, it being largely used in Europe and the United States in cakes, bread, pastry, confectionery, cheese, sauces, &c. The oil is also employed as an ingredient in alcoholic liquors.

The roots of the plant are sometimes considered to have a very agreeable taste, and are occasionally eaten in the North of Europe.

Per. Mat. Med., vol. ii, pt. 2, p. 160; Pharmacographia, p. 273; U. S. Disp., by W. & B., pp. 230 and 1304; Gmelin's Chemistry, vol. xiv (1860), pp. 283, 414, 416; Piesse's Art of Perfumery, p. 70; Buignet, Journ. de Pharm., Oct., 1861, p. 261; Journ. Chem. Soc., vol. x, p. 9; Pharm. Journ., vol. iii, 3rd ser., p. 746, and vol. vi, pp. 541 and 582; Med. Times, vol. xvii, p. 236; Flückiger, in Pharm. Journ., vol. vii, 3rd ser., p. 75.

DESCRIPTION OF PLATE.

Drawn from a plant in the Garden of the Apothecaries' Company, Chelsea.

1. Upper part of plant.
2. A root-leaf.
3. A flower.
4. A petal.
5. Section of ovary.

6 and 7. Fruit.

8. Commissural surface of a mericarp.
9. Transverse section of fruit.

(3–5 and 7–9 enlarged.)

D.Blair ad nat del. et lith.

M & N. Hanhart. imp.

CONVOLVULUS SCAMMONIA, *Linn.*

N. Ord. Convolvulaceæ.

Tribe *Convolvuleæ*.

Genus Convolvulus,* *Linn.* B. & H., Gen., ii, p. 874. Species about 150, natives of the temperate regions of both hemispheres, especially of Asia Minor.

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187. Convolvulus Scammonia,† *Linn., Sp. Plant., ed.* 1, *p.* 153 (1753).

Scammony.

Syn.—C. pseudo-Scammonia, *C. Koch.*

Figures.—Woodville, t. 86; Steph. & Ch., t. 60; Nees, t. 195; Hayne, xii, t. 35; Berg & Sch., t. 13 c; Flora Græca, t. 192.

Description.—A perennial herb, with a very long, straight, perpendicular, very gradually tapering, cylindrical, unbranched, woody root about ½ to 3 or 4 inches thick, smooth and yellowish outside, paler within and exuding milk when wounded, giving off scattered small root-fibres. Stems numerous, from the crown of the root, elongated, slender, cylindrical, smooth, hollow, twining, copiously branched, branches horizontal, spreading widely. Leaves alternate, scattered, on long petioles without stipules, deltoid-triangular, but varying in width, apex somewhat attenuated, very acute, base straight or more or less cordate, usually with one or two large jagged teeth on each side, the rest of the margin entire, smooth on both sides, punctate below. Flowers large, numerous, on long stalks, either solitary or in small trichotomous cymes, at the extremity of long axillary horizontal peduncles, bracts opposite, small, leaflike. Sepals 5, unequal, glabrous, green, the margins undulated, bordered with brownish-red, the two outer broadly oblong or ovate, the 3 inner longer and narrower, apiculate and toothed at the end. Corolla widely funnel-shaped 1½—2 inches wide at the mouth, very narrow at

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* From *convolvo*, to entwine; a mediæval name for some plants of the genus.

† *Scammonia*, in Greek σκαμμονία, the classical name for the plant.

the base, obscurely 5-lobed, with a faint notch between the divisions, delicate, smooth, pale yellow, slightly greenish at the base within, convolute and twisted in the bud, and marked on the outside of the folds with a pink tapering line. Stamens 5, inserted close to the base of the corolla, small, erect, filaments tapering, covered with small prominences, anthers linear, 2-celled, white. Ovary small, elevated on a thickened gynophore, 2-celled, with 2 ovules in each cell, style very slender, about as long as the stamens, white, stigmas 2, oblong, spreading, papillose. Fruit an ovate-globose capsule about ½ inch long, surrounded by the persistent reddish-brown sepals which it scarcely exceeds, capped by the withered style, pericarp thin, parchment-like, splitting vertically into 4 valves. Seeds 4, somewhat irregular in form, angular, testa dark brown, rough with small prominences; embryo green, cotyledons foliaceous, veined, twice folded on themselves, punctate with scattered pellucid dots, radicle long, slightly curved; endosperm scanty.

Habitat.—A native of the East, and common in waste places in most parts of Asia Minor, Greece, the Crimea, and Syria, but not extending to the western part of the Mediterranean district; the stems spread widely over the bushes which are profusely ornamented with the pretty pale sulphur-coloured flowers about the size of those of the common *C. arvensis* of England. The drug is collected from the wild plant in several parts of Asia Minor and in Syria.

Scammony has long been cultivated in English gardens, and is included in the catalogue of Gerard's garden published in 1596. It flowers in the autumn.

Choisy, in DC. Prod., ix, p. 412; Boiss., Fl. Orient., iv, p. 108; Lindl., Fl. Med., p. 398.

Official Parts and Names.—1. SCAMMONIÆ RADIX; the dried root: 2. SCAMMONIÆ RESINA; a resin prepared from Scammony Root or Scammony: 3. SCAMMONIUM; a gum-resin, obtained by incision from the living root (B. P.). 1. The dried root (*Scammoniæ Radix*): 2. Gum resin (*Scammonium, Scammony*),

obtained by incision from the living root (I. P.). Scammonium; a resinous exudation from the root (U. S. P.).

1. Scammoniæ Radix.—Dried Scammony root was introduced into the British Pharmacopœia in consequence of the extensive adulterations to which the ordinary scammony of commerce was liable; and also, as a means for obtaining the active principle of the drug at a moderate price. This root can scarcely be called a regular article of commerce, although it is sometimes to be met with in somewhat large quantities in the London market; it is, however, frequently collected in Syria and Asia Minor by collectors sent out by private firms for that purpose. The dried roots usually present a more or less twisted appearance; they vary in length from one to two or more feet, and in diameter from one to three or more inches, averaging about one inch. They are nearly cylindrical in form, except towards the crown, which is somewhat enlarged, and usually presents some remains of the slender aërial stems. They are covered by a greyish-brown or yellowish bark, are more or less shrivelled and longitudinally furrowed from contracting in the process of drying; and when fractured, they present a pale brown colour internally, and on the fractured surface the pure inspissated resin may be often seen in the form of irregular fragments of a pale yellowish-brown colour. They have a faint odour and taste, somewhat resembling jalap.

The active constituent of the root is *a resin*, which according to the experiments of Marquart, Flückiger and Hanbury, A. Hess, and others, occurs in the dried root, in proportions varying from about 3·5 to 6·5 per cent. The roots are richest in resin just before the plants flower; at which time, therefore, they should be collected for use in pharmacy. This resin is described below under the head of "Scammoniæ Resina." Amongst the other constituents of the root, are *gum, starch, sugar, tannic acid,* and *extractive*. The starch has been particularly described by Greenish, and he has urged the desirability of distinguishing the granules of scammony starch from those of wheat, which, as will be noticed under "Scammonium," is one of the common adulterants of the ordinary commercial scammony.

2. Scammoniæ Resina.—Scammony resin, or as it is sometimes termed when purified *scammonin*, is directed to be obtained either from scammony root or ordinary commercial scammony. According to Spirgatis, the resins obtained from these two sources are identical in appearance, in composition, in their relations to solvents, and in their reactions; a result which the experiments of Knujse had previously rendered doubtful. According to A. Hess, however, the resin prepared from the root uniformly contains tannic acid, while that prepared from commercial scammony is free from it.

The following are the characters and tests of scammony resin as prepared according to the directions of the British Pharmacopœia:—"In brownish translucent pieces, brittle, resinous in fracture; and if prepared from the root of a sweet fragrant odour. It cannot form singly an emulsion with water, by which it is distinguished from ordinary scammony. Its tincture does not render the fresh cut surface of a potato blue, indicating the absence of guaiacum resin." Ether dissolves it entirely, by which it is distinguished from jalap resin. It is also entirely soluble in alcohol. In a pure state scammony resin is colourless; and is identical with the resin called *Jalapin*, which is found in the root of *Ipomæa Orizabensis*, and has been described under the head of Woody Jalap or Orizaba Root, in our article on Exogonium purga.

3. Scammonium.—*Collection, Preparation, and Commerce.* Scammonium or Scammony is collected during the summer months, when the plant is in flower, as follows:—The peasant first clears away the bushes which shelter the plant, and after removing the earth from the root to the depth of from three to five inches, he then cuts through it in a slanting direction with a sickle-shaped knife, at from 2 to 4 inches below the crown; and a mussel-shell is immediately stuck into the root just beneath the lower part of the cut portion in order to receive the sap or milky juice which immediately flows out; this pure scammony when dry is a transparent gummy-looking substance of a golden-yellow colour. The quantity afforded by a single root varies very much according to its age, size, and locality; the

average quantity would appear to be about sixty grains. The shells are usually left till the evening, when they are collected, and the cut part of the root is also scraped with a knife to remove the dry or partially dry tears of scammony which adhere to it. The contents of the shells which are softer than the portions scraped from the roots, are called by the Smyrna peasants, *gala* or milk, and the latter *kaimak* or cream. Some of the scammony is generally allowed to dry in the shells, and is kept for use by the peasants; but scammony in shells is not met with in commerce.

Commercial scammony is obtained by the peasants emptying the contents of the shells and the portions scraped from the roots into a copper pot or leathern bag, which is carried home, and then the whole is incorporated with a knife into a homogeneous mass, which is at once allowed to dry. In this state the scammony is of the finest quality; but such scammony is very rarely met with; for usually the peasant, instead of drying off the scammony directly, allows his daily gatherings to accumulate until he has obtained a pound or more; he then softens it by exposure to sunshine, after which it is kneaded, either by itself, or by the addition of a little water, into a plastic mass, and finally dried. This constitutes the ordinary fine scammony of commerce known as *Virgin Scammony*. Scammony thus prepared, although containing no foreign substances, is not so good as that dried off as it is collected, for by its long retention in a semi-liquid state and exposure to heat, it undergoes fermentation, and acquires a dark colour and a strong cheesy odour; and when dried it has a porous or bubbly structure. These latter characters are not to be found in the scammony allowed to dry in the shell, or in that which is collected from the shells, &c., and dried off at once. Pure scammony is very liable to become mouldy, and also, after some time, to be covered with a white crystalline efflorescence; but such changes do not occur if the scammony is kept quite dry.

Scammony is very much adulterated; commonly by the peasants themselves before it is brought to the market; but also

by the dealers who purchase it for that purpose of the peasants in a half-dried state. The substances most frequently used as adulterants are carbonate of lime and wheat-flour; but wood-ashes, sand, gum, tragacanth, powdered scammony roots, common resin, gypsum, black-lead, and other substances are also employed for the purpose.

Scammony is chiefly exported from Smyrna, and from the province of Aleppo, although in the consular returns of the Aleppo market for 1875, scammony does not appear at all. In former times Aleppo Scammony was regarded as the best kind; but Smyrna Scammony is now much preferred to it, and is therefore of higher commercial value. Scammony is generally shipped in small cases containing about thirty pounds each.

General Characters and Composition.—The best kind of scammony—namely, that which is simply the pure juice dried as soon as it is collected—is in more or less flattened or amorphous pieces, of from about half an inch to an inch in thickness. In mass it has a somewhat chestnut-brown colour, but when reduced to small fragments, these are of a pale yellowish- or somewhat reddish-brown colour, and transparent. The pieces are very brittle, and when broken the fractured surface presents a shining vitreous appearance, and has but few or no air cavities. It yields from 88 to 90 per cent., or more, of resin. Scammony of this quality is, however, but rarely met with, the ordinary best commercial scammony being that which we have already noticed under the name of Virgin Scammony, the characters of which are as follows:—In flattish cakes or amorphous pieces, of an ash-grey or somewhat blackish colour externally, and sometimes covered with a greyish-white powder from the lumps rubbing against each other. It is very brittle, and is readily reduced to fragments by the pressure of the nail, or between the fingers. Its powder is of an ash-grey colour, and when triturated with water it forms a smooth emulsion; and the cooled decoction is not rendered blue by solution of iodine, indicating the absence of starchy substances. Its fresh fractured surface is resinous, shining, of a uniform dark greyish-black

colour, and usually of a more or less porous, and somewhat bubbly appearance; when rubbed with the moistened finger it readily forms a whitish emulsion, by which it is distinguished from scammony resin; and when touched with hydrochloric acid it does not effervesce, indicating the absence of chalk. Thin fragments when viewed by transmitted light are translucent, and of a greyish- or yellowish-brown colour. It has a peculiar odour, resembling that of old cheese; and when chewed it has very little taste at first, but it causes afterwards a slight prickly sensation in the back of the throat. Ether removes from 80 to 90 per cent. of resin, and what remains is chiefly soluble gum, with a little moisture.

Medical Properties and Uses.—The effects of both ordinary scammony and resin of scammony are those of a certain and powerful drastic cathartic, closely resembling jalap, but somewhat more irritant and active. Scammony usually causes much watery discharge, and frequently griping; it is generally given in conjunction with other purgatives. On account of its irritant qualities it is contra-indicated in inflammatory conditions of the alimentary canal: but it is particularly well adapted for cases of constipation depending upon torpidity of the bowels. It is also well adapted for children on account of the smallness of the dose required, its little taste, and the safety and certainty of its action; hence in combination with calomel it is a common vermifuge for children. It is also employed as a derivative purgative in cerebral affections and dropsies; and in other cases where an active cathartic is required, when its use is not contra-indicated by its irritant properties. As a purgative the resin is commonly given in somewhat smaller doses than the ordinary scammony of commerce, but when the latter is pure there is scarcely any difference in their effect.

Steph. & Church., Med. Bot., by Burnett, vol. i, pl. 60; Per. Mat. Med., vol. ii, pt. 1, p. 600; Per. Mat. Med., by B. & R., p. 626; Pharmacographia, p. 394; U. S. Disp., by W. & B., pp. 785 and 1388; Buchner's Neues Repertorium, 1864 (13, No. 10, p. 448); Buchner, in Pharm. Journ., vol. xiv, 1st ser., p. 38; Pharm. Journ., vol. xvii, 1st ser., pp. 37, 447, 451,

and 453; Spirgatis, in Pharm. Journ., vol. v, 3rd ser., p. 65; A. Hess, Archiv der Pharmacie, vol. iii, p. 223, and Pharm. Journ., vol. vi, 3rd ser., p. 122; Maltass, in Pharm. Journ., vol. xiii, 1st ser., p. 264; Boulier, in Pharm. Journ., vol. i, 2nd ser., p. 521; Haselden, in Pharm. Journ., vol. v, 3rd ser., p. 41; Greenish, in Pharm. Journ., vol. v, 3rd ser., p. 263; Proc. Amer. Pharm. Ass. (1875), vol. xxiii, pp. 152–154.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Royal Gardens, Kew, flowering in September; the fruit added from a specimen from Cilicia in the British Museum.

1. Portion of a branch with flowers.
2. The stamens.
3. The pistil.
4. Vertical, and—6. Transverse section of the ovary.
5. Stigmas.
7. Capsules.
8. Seed.
9. Section of the same.
10. Embryo.
11. Cotyledon flattened out.
12. Portion of root of a young plant.

(4–6, 9–11 enlarged.)

D Blair ad nat. del et lith.

M & N Hanhart imp.

LAVANDULA VERA, *DC.*

N. Ord. LABIATÆ.

Tribe *Ocymoideæ*.

Genus Lavandula,* *Linn.* B. & H., Gen., ii, p. 1179. Species 20, inhabitants of the Mediterranean district and S. W. Asia.

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199. Lavandula vera, *DC., Fl. Franc., Supp., p.* 398 (1815).

Lavender.

Syn.—L. Spica, var. *α*, *Linn.* L. vulgaris, var. *a*, *Lam.* L. officinalis, *Chaix.* L. pyrenaica, *DC.* L. angustifolia, *Hayne.*

Figures.—Hayne, viii, t. 37; Nees, t. 178; Berg & Sch., t. 26 b; Nees, Gen. Fl. Germ.; Reich., Ic. Fl. Germ., xviii, t. 26, fig. 1.

Description.—A shrub of 1 to 3 feet high (or somewhat taller in gardens), with a short but irregular, crooked, much branched stem covered with yellowish-grey bark which comes off in flakes, and very numerous, erect, straight, broom-like, slender, bluntly quadrangular branches, finely pubescent with stellate hairs. Leaves opposite, entire, sessile, linear, blunt, when young white with a dense tomentum of stellate hairs on both surfaces and the margins strongly revolute, when full-grown over 1½ inch long, green, pulverulous with scattered hairs above, smooth or very finely downy beneath, the margins slightly revolute. Flowers very shortly stalked, 3—5 together in little opposite cymes in the axils of ovate, acuminate, brown, scarious bracts, and thus forming dense few-flowered whorls 4—10 in number, crowded at the extremity of long naked branches in short blunt spikes, the lowest whorl often separated by a long internode from the rest. Calyx ovoid-oblong, tubular, somewhat contracted at the mouth, with a single, tongue-like ovate tooth at the back, the rest of the margin almost straight and truncate, 13-nerved, densely covered with a close tomentum of blue stellate hairs and minute glands. Corolla tubular, wider above, about twice the length of the calyx, 2-lipped,

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* *Lavandula*, or *Lavendula*, apparently a name of the middle ages, indicating the use of the plant in baths (*lavare*, to wash).

slightly hairy outside, violet coloured, mouth oblique, upper lip large erect, divided into 2 blunt lobes, lower lip shorter, cut into 3 nearly equal blunt segments, tube very hairy within. Stamens 4, inserted about the middle of the tube, filaments short, white, 2 anterior longer, anthers 2-celled, dark purplish-brown, cells rounded, divaricate, fringed with hairs, pollen orange. Style about as long as the corolla-tube, stigma blunt, shortly bifid. Achenes smooth, pale brown.

Habitat.—The Lavender grows wild in hilly districts at a considerable elevation above the sea in the south of France, Spain, Northern Italy and other parts of the Mediterranean region, including North Africa, but does not reach Asia Minor. As a garden plant it is a very old favorite, being quite hardy in this country and throughout Northern and Central Europe. In the neighbourhood of Mitcham it is grown on a large scale, and it is also cultivated at Hitchin and in Lincolnshire.

L. latifolia, Vill. (L. Spica, var. β, *Linn.*, L. Spica, *DC.*), is now maintained by most writers as a distinct species from *L. vera.* It is a more delicate plant, and cannot be cultivated in the open air in this country. It is figured in Hayne, viii, t. 38, Nees, t. 179, and Steph. and Church., t. 40, and has a very close similarity to the common Lavender.

Gren. & Godr., Fl. France, ii, p. 647; Willk. & Lange, Prod. Fl. Hisp., ii, p. 391; Flück. & Hanb., Pharmacogr., p. 428; Lindl., Fl. Med., p. 485.

Official Parts and Names.—Oleum Lavandulæ; the oil distilled in Britain from the flowers (B. P.). The oil (*Oleum Lavandulæ*) obtained by distillation from the flowers (I. P.). Lavandula; the flowers (U. S. P.).

1. Lavandula, *Lavender flowers.*—These flowers have a greyish-blue colour when dried, a strong fragrant odour, and a warm, bitterish, aromatic taste. Their odour is long retained after drying. The flowering stalks are usually gathered in the early part of July, and either dried entire in the shade or by a gentle heat, and then made up into bundles; or the flowers are stripped from the stalks and dried by a moderate heat.

The essential constituent of lavender flowers is the volatile oil (*Oleum Lavandulæ*), which is described below.

Medical Properties and Uses.—The flowers are carminative, mildly stimulant, and tonic, but they are not now employed in a crude state in medicine, at least, in this country, and but very little elsewhere. The flowers and leaves were formerly used as a sternutatory; and probably still enter into the composition of some cephalic snuffs. Burnett says, "The ancients employed the flowers and the leaves to aromatise their baths, and to give a sweet scent to water in which they washed; hence the generic name of the plant." They are still used to some extent to perfume linen, &c., and as a preventive to the access of moth; and also when powdered, as an ingredient in sachets, &c.; their principal use is, however, as the source of the volatile oil.

2. Oleum Lavandulæ, *Oil of Lavender.—Preparation.* The oil is usually distilled from the flowers and flower-stalks conjointly, as gathered and brought from the fields, and either fresh or in a more or less dried state; some distil the flowering part only, while a few distil the flowers alone after they have been stripped entirely from the stalks. The finest oil is obtained by the latter process; that derived from the stalks is small in quantity and of inferior quality, and its admixture with the former therefore deteriorates its quality. When distilled with the stalks, it is said that the finest oil is drawn during the first two hours and a half, and is considered to come from the flowers; that which comes afterwards is second or third quality. The amount of oil, according to Bell, obtained from the flowers deprived of stalks, afforded on an average of three years, 1½ per cent.; and at Hitchin, according to Perks, 60 lbs. of good flowers yield on an average 16 fluid ounces of oil. Mr. Perks has also informed us that an acre of land will yield "about 6 Winchester quarts" of oil.

General Characters and Composition.—Oil of Lavender is pale yellow, with the very fragrant odour of the flowers, and a hot, bitter, aromatic taste. It is lævogyrate; and has a specific gravity which varies according to Zeller, from 0·87 to 0·94. It is

a mixture in varying proportions of a fluid hydrocarbon and stearoptene, which, according to Dumas, is identical with camphor. Oil of Lavender is also produced to some extent in the south of France and Piedmont; but the foreign oil is of very inferior quality, the best foreign oil only fetching about one sixth of the price of the best English oil.

Medical Properties and Uses.—Oil of Lavender has stimulant and carminative properties, and is used in hysteria, nervous headache, and other nervous affections; also in flatulence and colic. It is chiefly given in the form of the official compound tincture and spirit of lavender. It is also commonly employed for scenting evaporating lotions, as well as ointments, and liniments.

The more important consumption of oil of lavender is, however, in perfumery, in which it is still extensively employed, although not to the same extent as formerly.

Per. Mat. Med., by B. & R., p. 581; Pharmacographia, p. 428; U. S. Disp., by W. & B., pp. 523 and 1309; Piesse's Art of Perfumery, p. 93; Bell, in Pharm. Journ., vol. viii, 1st ser., p. 276; Bentley, in Pharm. Journ., vol. i, 2nd ser., p. 278; Warren, in Pharm. Journ., vol. vi, 2nd ser., p. 257.

DESCRIPTION OF PLATE.

Drawn from a plant in the Apothecaries' Garden, Chelsea.

1. A branch with inflorescence.
2. Lateral, and—3. Front view of a flower.
4. Corolla cut open.
5. Calyx laid open.
6. Pistil.

(2–6 enlarged.)

D.Blair ad nat. del. et lith.

M&N.Hanhart, imp.

NEPETA CATARIA, *Linn.*

N. Ord. LABIATÆ.

Tribe *Nepeteæ*.

Genus Nepeta,* *Linn.* B. & H., Gen., ii, p. 1199. Species 120, chiefly found in the extra-tropical regions of the old world.

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209. Nepeta Cataria,† *Linn., Sp. Plant., ed.* 1, *p.* 570 (1753).

Catmint. Catnep.

Syn.—Cataria vulgaris, *Moench.*

Figures.—Hayne, iv, t. 8; Syme, E. Bot., viii, t. 1054; Reichenb., Ic. Fl. Germ., xviii, t. 1242.

Description.—A perennial herb with a thick rootstock and erect, stout, stiff, quadrangular, finely but densely pubescent stems, 2 or 3 feet high, with spreading branches. Leaves opposite, on longish stalks, ovate or oblong-ovate, with a cordate base and acute apex, 1—3 inches long, strongly and deeply dentate-serrate, pubescent on both sides, densely so and grey beneath. Flowers numerous, very shortly stalked, arranged in dense paniculate cymes, the lower stalked, the upper sessile, aggregated at the ends of the stem and branches into short, broad, blunt, rounded spikes, bractlets setaceous, and, with the pedicels &c., grey-pubescent. Calyx tubular, ovate-oblong, somewhat gibbous below, with 15 ribs, densely pubescent, oblique at the mouth, divided into 5 triangular subulate teeth, the uppermost one the longest. Corolla with a rather short, curved tube, dilated above, pubescent externally, smooth within, upper lip small, rounded, notched, lower lip 3-lobed, the two lateral lobes small, the middle large, dilated, concave, rounded, truncate, the edge dentate, whitish or pale pink, dotted with lilac, buds pale orange. Stamens 4, under the upper lip, scarcely exserted, upper pair longest, anther-cells divaricate and continuous, purple. Achenes rather large, dark brown, granular.

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* *Nepeta*, the classical name for the plant.

† *Cataria*, a mediæval herbarists' name, from the fondness of cats for this species.

Habitat.—In this country Catmint occurs on dry banks and waste ground, chiefly in the South of England, and especially on chalky soil, and flowers in the late summer and autumn. There seems to be no very good reason for regarding it otherwise than as a truly native plant here. It grows throughout Europe, and extends into Siberia, Western Asia, and the Himalaya. In the United States of America it has become naturalised, and is now a common weed near habitations.

Syme, E. Bot., viii, p. 38; Hook. f., Stud. Fl., p. 285; Watson, Comp. Cyb. Br., p. 277; A. Gray, Man. U. States, p. 353; Benth., in DC. Prod., xii, p. 383; Gren. & Godr., Fl. France, ii, p. 675; Ledebour, Fl. Ross., iii, p. 374.

Official Part and Name.—Cataria, *Catnep;* the leaves and tops (U. S. P.). Before the issue of the present United States Pharmacopœia, the leaves only were recognised in that volume. It is not official in the British Pharmacopœia, or the Pharmacopœia of India.

General Characters and Composition.—*Catnep,* or *catmint* as it is also termed, derives its names from the fondness of cats for it, especially when it is withered. The dried entire herb is commonly used in the United States. It has a strong, peculiar, somewhat aromatic, and disagreeable odour, suggestive of a mixture of Mint and Pennyroyal; and a warm, bitterish, aromatic, and camphoraceous taste.

No complete analysis has been made, but the active constituents are stated to be a *volatile oil* and *tannic acid.* It is probable also that it contains some *bitter matter.* Its virtues are extracted by water; and its cold watery infusion assumes an olive-green tint on the addition of a persalt of iron.

Medical Properties and Uses.—Catnep had formerly some reputation in this country in domestic practice as a remedy in chlorosis and other diseases of women, but it appears to have almost or entirely gone out of use. In the United States it is, however, a good deal employed in domestic practice; but although it has been long retained in the Primary List of the Materia

Medica in the Pharmacopœia of that country, it is but little employed by the regular medical practitioner. Its properties do not appear therefore to be very marked; although it is reputed to closely resemble the mints in its action, and to be mildly stimulant, tonic, antispasmodic, and emmenagogue. It is commonly administered in the form of infusion, and has been used in hysteria, chlorosis, amenorrhœa, flatulent colic of infants, and in other affections. When chewed, or locally applied in other ways, to a diseased tooth, it is said to relieve toothache.

Gerarde's Herball, by Johnson (1636), p. 783; Miller's Gard. Dict., vol. ii, pt. 1; U. S. Disp., by W. & B., p. 240.

DESCRIPTION OF PLATE.

Drawn from a specimen collected by Mr. Britten at High Wycombe, Bucks, flowering in August.

1. Upper part of a flowering stem.
2. A flower.
3. A calyx.
4. Corolla laid open.
5. Anthers.
6. Pistil.
7. Section through gynophore.

(2–7 enlarged.)

D'Blair, ad nat. del. et lith.

M&N Hanhart imp.

MARRUBIUM VULGARE, *Linn.*

N. Ord. LABIATÆ.

Tribe *Stachydeæ*.

Genus **Marrubium**,* *Linn.* B. & H., ii, p. 1206. Species 30, natives of temperate Europe and Asia and the Mediterranean region.

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210. Marrubium vulgare, *Linn., Sp. Plant., ed.* 1, *p.* 583 (1753).

Horehound. White Horehound.

Figures.—Woodville, t. 118; Steph. & Ch., t. 135; Nees, t. 174; Hayne, xi, t. 40; Berg & Sch., t. 24 b; Syme, E. Bot., vii, t. 1064; Reich., Ic. Fl. Germ., xviii, t. 1224.

Description.—A perennial herb with a short rootstock giving off several stout, tough stems, about 1 foot high, branched below, bluntly quadrangular, more rounded below, densely covered, especially when young, with a thick white cottony felt. Leaves opposite, blade reaching an inch in length, on a long, broad, woolly petiole, ovate, acute or blunt, coarsely crenate-serrate, veins very prominent on the under surface, depressed above, making the leaf very wrinkled, the larger ones radiating from the petiole, pale silvery-green, downy above, very cottony beneath. Flowers sessile, few, crowded, small, forming small, very dense, rounded whorls in the axils of the upper leaves, bracts linear, woolly. Calyx tubular, oblong, cylindrical, faintly 10-ribbed, woolly externally with stellate hairs, with 10 spreading, spinous, fringed, rather short teeth, hooked at the ends, the 5 alternate ones shorter, the throat with a ring of long hairs inside. Corolla slightly exceeding calyx, with a slender tube, bilabiate, the upper lip longer than the lower, narrow, oblong, deeply bifid, the lower 3-fid, white, glabrous. Stamens 4, inserted about midway in the tube and included in it, anther-cells confluent by their apices. Style bifid, branches very short. Achenes dark brown, blunt.

Habitat. — This plant grows in waste ground throughout

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* *Marrubium*, the classical Latin name.

Europe (except the extreme north), the Mediterranean district and Western Asia as far as India; in N. America it is introduced. The Horehound is not common in England, and is most frequently met with in the southern counties in dry chalky or sandy soil; it is supposed by some writers not to be a native British plant, and is no doubt often an outcast from gardens, where it is frequently cultivated. It flowers in the autumn.

Syme, E. Bot., vii, p. 51; Hook. f., Stud. Fl., p. 288; Watson, Comp. Cyb. Brit., p. 277; Gren. & Godr., Fl. France, ii, p. 699; Benth., in DC. Prod., xii, p. 453; Lindl., Fl. Med., p. 494.

Official Part and Name.—MARRUBIUM, *Horehound;* the leaves and tops (U. S. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of India. It was, however, formerly official in the Pharmacopœias of this country.

General Characters and Composition.—The whole herb, which is commonly known under the name of *horehound,* is used in medicine. In a fresh state it has a strong, peculiar, aromatic, and rather agreeable odour; but this is diminished by drying, and when long kept is completely lost. The taste is bitter, penetrating, and permanent. Its bitterness is extracted both by water and alcohol.

Its essential constituents are a *volatile oil,* and a *bitter principle;* but it also contains *resin, tannic acid,* and *lignin.* Its infusion is reddened by litmus, and the addition to it of a persalt of iron causes a deep olive-green precipitate.

Medical Properties and Uses. — Horehound possesses tonic, aromatic, stimulant, expectorant, diaphoretic, and diuretic properties; it is also laxative in large doses, and was formerly regarded as emmenagogue. It is now but very rarely used by medical practitioners, but it was formerly much esteemed in various uterine, visceral, and hepatic affections; and in phthisis. Dr. A. T. Thompson states, that he has seen much benefit produced by it in catarrh in which there is much cough, with copious excretion of mucus, nocturnal sweats, and great prostration of strength. He speaks also of its value in phthisis. As a

domestic remedy, and more especially by the poor, it is still a good deal employed in chronic pulmonary complaints, especially catarrh, attended with cough and copious expectoration. A common form of administration is *horehound tea*, prepared by infusing one ounce of the herb in a pint of boiling water, and of which a wine-glassful is taken as a dose, two or three times a day. The medicine is also much used in form of syrup of horehound and candied horehound.

Steph. & Church., Med. Bot., by Burnett, vol. iii, pl. 135; Per. Mat. Med., vol. ii, pt. 1, p. 521; U. S. Disp., by W. & B., p. 552; Cyc. Pract. Med., vol. ii, p. 126.

DESCRIPTION OF PLATE.

Drawn from a plant collected near Sevenoaks, Kent, flowering in August.

1. Base of the plant.
2. A branch with flowers.
3. A flower.
4. Calyx.
5. Corolla, slit open.
6. Pistil.

(3–6 enlarged.)

D.Blair, ad nat. del. et lith.

M&N Hanhart imp.

ERYTHROXYLON COCA, *Lam.*

N. Ord. LINACEÆ.

Tribe *Erythroxyleæ*. Lindl., Veg. K., p. 391 (*N. Ord.*); Le Maout and Dec., p. 294.

Genus **Erythroxylon**,* *Linn.* B. & H., Gen., i, p. 244; Baill., Hist. Pl., v, p. 65. Species about 50, mostly natives of S. America, but some of Africa and India.

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40. Erythroxylon Coca,† *Lamarck, Dict.* ii, *p.* 393 (1786).

Coca. Cochuco. Hayo. Ipadu.

Figures.—Cavanilles, Diss., t. 229; Compend. Bot. Mag., ii, t. 21; Le Maout & Dec., p. 295; Baill., Hist., pl. v, figs. 80–87.

Description.—A small shrub of 2—4 feet or more high, bushy and much branched, with a purplish-brown wrinkled bark, the young twigs smooth. Leaves closely placed, alternate, shortly-stalked, 1—2 inches long, lanceolate or oval, rather attenuated into the petiole, usually blunt and emarginate with a small apiculus in the notch at the apex, perfectly entire, soon falling, rather thin, bright green above, paler and glaucous beneath, quite glabrous, midrib prominent, lateral veins numerous, faint, freely anastomosing; on either side of the midrib as far as a well-defined, curved, raised line less than midway between it and the margin of the leaf and extending from base to apex, the surface is somewhat concave, paler in colour and with the veins less prominent; stipules small, cauline, combined along their inner edge to form a single, triangular, acute, denticulate organ between the petiole and the stem (intrapetiolar), very persistent, at first thin, greenish and transparent, afterwards, when the leaves have fallen, brown, stiff, and almost spinous, and marked on the back at the base by the scar of the petiole. Flowers small, on slender, drooping, glabrous stalks about ¼ inch long, 3 or 4 together in the axils of the leaves or of the persistent stipules, with several small broad bracts at the base. Calyx very deeply cut into 5 triangular-ovate,

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* Name from *ἐρυθρός*, red, and *ξύλον*, wood; applicable to some species.

† *Coca*, the native name; meaning the "tree" or "plant" *par excellence*.

acute, glabrous segments. Petals 5, alternating with the calyx-lobes, imbricate, with a broad claw, and a broadly oval-oblong, spreading, concave, obtuse limb, pale yellow, provided at the point of junction of limb and claw with an erect scale (ligula), which is very deeply bifid with the two lobes crisped at the margins and a reflexed tongue between them. Stamens 10, hypogynous, equal, longer than the petals, erect, united at the base into a short, fleshy tube surrounding the ovary, filaments white, smooth, anthers oblong, yellow, basifixed. Ovary superior, ovoid, smooth, normally 3-celled, but usually 1-celled the others being abortive, ovule solitary, styles 3, erect, cylindrical, green, stigmas capitate. Fruit a small indehiscent drupe less than ½ inch long, oblong-ovoid, pointed, surrounded at the base by the persistent calyx and staminal tube, smooth (furrowed when dry), red, sarcocarp scanty, endocarp thin. Seed filling the endocarp, with a thin testa, embryo straight with a superior radicle and flat cotyledons, in the axis of cartilaginous endosperm.

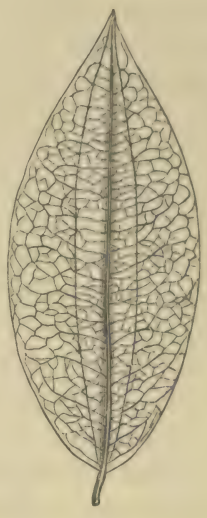
Habitat.—The Coca is cultivated to a very large extent in the Andes of Peru and in Bolivia and Colombia, especially in the very moist mild climate met with at from 2000—5000 feet above sea-level or higher; it is also now grown in parts of Brazil, the Argentine States, and other countries of South America. Though without doubt a native of some of the same districts, it is scarcely known in a wild state; Poeppig considered it so at Cuchero and on the summit of the Cerro de San Cristobal in Peru, but Weddell in Bolivia only saw the cultivated plant.

The plantations (called "cocals") are always formed on the steep warm declivities of the mountains, the original forest growth being cleared for the purpose. The largest and most productive are in the province of La Paz in Bolivia. The Coca plants are said to resemble in habit small black-thorn bushes, and the nearly inodorous flowers are abundantly produced.

It is scarcely possible to mistake the leaves of Coca for those of any other plant, the two longitudinal arched lines on the under surface being characteristic. These, which are found in several other species of *Erythroxylon*, are not, as often described, veins or

nerves, but folds or creases produced by the mode in which the leaves are packed in the bud. A fully grown leaf is shown in the woodcut below, drawn from a specimen from Bolivia in the British Museum.

The precise date of the introduction of Coca into England we have not ascertained, but it was probably not many years previously to 1870; specimens are now to be seen in the houses of several of our botanic gardens.



Clusius, Exotic. (1605), p. 176; DC., Prod., i, p. 575; Poeppig, Reise in Chili, ii, p. 209, translated in Hook., Companion to Bot. Mag., i, p. 161; Lindl., Fl. Med., p. 199; Weddell, Voyage dans le Nord de la Bolivie, p. 514, translated in Pharm. Journ., 1855, pp. 162, 213; Dowdeswell, in Lancet, April 24th, 1876.

Part Used and Name.—Coca; the dried leaves. It is not official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United States. But Coca was in general use by the natives of Peru at the time of the conquest of that country, and has continued to be more or less extensively employed up to the present time.

Collection, Preparation, and Commerce.—Much care is taken in the gathering, drying, and preservation of coca, as its activity and value depend in a great measure on its mode of preparation. Some differences in detail occur in the collection and preparation of coca in different districts, but as a general rule the processes are as follows:—The leaves are gathered as soon as they have arrived at maturity, at which period they are bright green on their upper surface, and yellowish-green on their under surface; and have an agreeable and somewhat aromatic odour. The leaves are gathered separately and carefully by the hand, with the two-fold object of preventing them being crushed or bruised in the

process; and also so as not to injure the young leaf-buds which are left behind, for the purpose of obtaining a second crop of leaves. They are then carried away in baskets, and spread out on paved surfaces, or on the floors in the courts of the houses, or sometimes on woollen cloths; and dried slowly in the sun. This operation requires great care, for if the leaves be dried too rapidly, they lose their odour and green colour; and if stored away before they are thoroughly dried their colour is also changed, and they acquire a disagreeable odour and taste. In some districts the leaves are occasionally trampled over while they are damp, under the impression, it is said, that they thus acquire a delicate flavour and smell; but also, probably, to preserve their flatness in the drying process. After being dried, the leaves are either stored in barns or huts; or packed in bags or bales, in which they are pressed by treading, and are thus transported to a distance. These bags or bales (*cestos*) appear to differ very much in size, their weight being variously given by authors at from 24 to 150 lbs. As the properties of coca are injured by transportation, and often by keeping, it would probably be best preserved in cases or packages lined with tin, or at least in well-closed pots to protect it from air and moisture. The produce of coca per acre in a good harvest is estimated by Weddell at about 900 lbs.; and in some districts there are three or even four harvests in the year. The total produce of coca is probably not less than 40,000,000 lbs., which, estimating the value on an average at the low price of one shilling per pound (for the best qualities yield at least five shillings) in the countries in which it is produced, would represent a total value of £2,000,000; so that coca is by no means an unimportant article of commerce, and its production is moreover described as being very remunerative. It is chiefly exported from Lima.

General Characters and Composition.—Commercial specimens of coca either consist of the leaves more or less pressed together in compact masses, or of the leaves in a loose state or separate from one another. In either case the leaves are not curved or rolled in any degree, but perfectly flat. When carefully

prepared the leaves are unbroken, of a fine green colour, and a delicate agreeable somewhat aromatic odour, which is at once perceptible when they are bruised, and which has been compared to the combined odour of hay and chocolate; but specimens are often met with in which the green colour is replaced by brownish, yellowish- or reddish-brown tints, and the odour lost or of a more or less disagreeable character. Coca when fresh has a somewhat aromatic and slightly bitter taste; and when carefully dried it has a similar flavour; but in other cases its aroma is lost, and it is simply bitter and disagreeable. Coca of commerce varies very much indeed in quality.

Coca has been analysed by Niemann, Stanislas Martin, Maisch, Lossen, Woehler, and other chemists; and the results of their investigations show that its principal constituents are, a crystalline alkaloid called *cocaine*, a volatile odoriferous alkaloid named *hygrine*, *coca-tannic acid* and *coca-wax*. *Cocaine* is described as crystallizing in small colourless inodorous prisms, having a slightly bitter taste; sparingly soluble in water, more soluble in alcohol, and still more so in ether; it is strongly alkaline, and in most of its reactions is said to resemble atropia. When heated with strong hydrochloric acid it is resolved into a new alkaloid *ecgonine*, together with *methyl alcohol*, and *benzoic acid*. *Hygrine* at ordinary temperatures is a thick oily liquid of a yellowish colour, dissolving readily in alcohol and ether, but only partially soluble in water. "It possesses a strong alkaline reaction, a burning taste, and an odour of trimethylamin." The medicinal properties of coca would appear to depend essentially on cocaine and hygrine. Both these alkaloids seem to be in combination with one or more acids; probably the variety of tannic acid already mentioned, as the addition of lime or other alkali is said to increase to a great extent the flavour and activity of the drug. This latter fact has a very important bearing on the preparations of coca; as those obtained by the agency of milk of lime would thus appear to be more active than simple infusions or extracts of the drug; the latter are, however, frequently used.

Properties and Uses.—Coca has been used by the natives of Peru and some other parts of South America from the earliest periods. The Indians ascribe to it many and great virtues. Thus they believe that it possesses marvellous sustaining powers, and that its use enables them to undergo great fatigue and want of sleep for a long time in the absence of food. Commonly the Indians pass whole days in travelling or working without any food, but simply chew coca; but they eat freely in the evenings. It is also employed as a stimulant or narcotic in the same manner as tobacco, opium, and alcohol are thus used in other countries. The use of coca is also said to prevent the difficulty of respiration which is generally experienced in ascending high and steep mountains. The leaves are likewise regarded as a very valuable application to ulcers, boils, &c.; also to stop hæmorrhage; and for the relief of headache, neuralgia, &c. In the form of infusion coca is also employed in asthma, colic, jaundice, hypochondriasis, and many other affections. Indeed, coca is to the Indians almost a necessity, and to be deprived of it would be felt by them more than the loss of any other substance. Every Indian carries with him suspended from his belt a little bag or pouch called *huallqui* or the *chuspa,* which contains coca; and also a little bottle-gourd or calabash (*ishcupura*) containing some finely powdered lime, or wood ashes formed of the burnt stems of the *Chenopodium Quinoa, Cecropia peltata,* or other plants. This bottle-gourd has frequently a wooden or metal needle attached to its stopper; otherwise the Indian also takes with him a little stick or slip of wood for the purpose of helping himself to its contents as he desires. The native takes his coca three or four times a day; and in doing so he first removes the leaves separately from the pouch and places them in his mouth, and with his tongue forms them into a kind of ball; he then moistens the slip of wood or needle in the stopper of the calabash with saliva, and dips it into the lime or wood ashes which is locally termed the *Llipta,* and presses it on the ball of leaves in his mouth. The lime is added as already noticed under the belief that it develops the flavour of the coca, and also it is said to produce a flow of saliva, which is

either entirely swallowed or partially expectorated. This operation of chewing generally takes about a quarter of an hour, during which period the Indians remain perfectly at rest and are silent. In some cases, however, as with post-runners, drivers, and miners, the chewing is continuous.

The extraordinary virtues ascribed to coca by the Indians has naturally excited the attention of numerous travellers, physicians, and other persons, and their opinion of its merits will be best judged of by a few references to their published statements. Thus Poeppig states, that the miners chewing it every three hours with a handful of maize will do such severe work in the mine for twelve hours as no European could effect; and that an Indian runner will carry a load of a hundred weight for ten leagues over rough roads in eight hours by its aid alone. Von Tschudi and Dr. Scherzer have also given similar testimony to the effects of coca; and the former especially refers to the effect it had on himself in greatly assisting respiration, and thus enabling him to ascend the mountains with ease in hunting. Stevenson also, who for twenty years resided in Peru, and was Secretary to the Governor of Quito, states "that the natives in the mines and travelling derive such sustenance from chewing these leaves that they frequently take no food for four or five days, though constantly working; and that they had told him that with a good supply of coca, they felt neither hunger, thirst, nor fatigue, and that without inconvenience or injury they could remain eight or ten days without sleep." Dr. Weddell, Spruce, Markham, and numerous other travellers and scientific observers, also attribute the same effects to it. Markham says, "I chewed coca, not constantly, but very frequently, and besides the agreeable soothing feeling it produced, I found I could endure long abstinence from food with less inconvenience than I should otherwise have felt, and it enabled me to ascend precipitous mountain sides with a feeling of lightness and elasticity, and without losing breath." Most writers, however, agree, that when coca is taken in excess it produces highly injurious effects like the immoderate consumption of other stimulants or narcotics, such as fermented

liquors, tobacco, opium, and Indian hemp. An habitual chewer is termed a *coquero*, and is said to be at once known "by his haggard look, gloomy and solitary habit, listless inability, and disinclination for any active employment." Weddell says its habitual use acts on Europeans more prejudicially than on the Indians accustomed to it from their early years; and that in some cases it causes a peculiar aberration of intellect, characterised by hallucinations. Von Tschudi and Poeppig also state that the result of intemperance in its use is frequently confirmed idiocy. More recently Dr. Mantegazza, of Berlin, who formerly practised in South America, from numerous experiments drew the following conclusions:—The leaves chewed or taken in weak infusion have a stimulating effect on the nerves of the stomach, and thus greatly assist digestion. In a medium dose of three or four drachms, coca excites the nervous system in such a manner that muscular exertion is made with great ease; then it produces a calming effect. In a large dose it increases the animal heat and augments the frequency of the pulse, and consequently of respiration. Used in excessive doses it causes delirium, hallucinations, and, finally, congestion of the brain. He recommends its use as an antispasmodic; for colic, flatulence, diarrhœa, and impaired digestion; in dyspeptic and all spasmodic affections; as a tonic in debility and nervous prostration; in hysteria and melancholia; as a safe aphrodisiac in seminal debility; and in other affections. Many other practitioners have also spoken in eulogistic terms of its value as a remedial agent in a variety of diseases; and the sulphate of cocaine has even been recommended as a substitute for sulphate of quinia in intermittent fevers. Dr. Buzzard, however, who tried it extensively in epilepsy and other forms of nervous diseases some years ago, obtained no striking effects from its use.

More recently the address of Sir Robert Christison to the Royal Botanical Society of Edinburgh has been especially the means of drawing attention to the alleged properties of coca. From experiments made by Christison on himself, and also from those made by several students at his request by chewing coca

without the addition of the *Llipta* which he regards as useless, he drew the following conclusions :—" The chewing of coca removes extreme fatigue, and prevents it. Hunger and thirst are suspended; but eventually appetite and digestion are unaffected. No injury whatever is sustained at the time or subsequently in occasional trials; but I can say nothing of what may or may not happen if it be used habitually. From sixty to ninety grains are sufficient for one trial; but some persons either require more, or are constitutionally proof against its restorative action. It has no effect on the mental faculties, so far as my own observations go, except liberating them from the dulness and drowsiness which follow great bodily fatigue. I do not yet know its effect on mental fatigue purely. As to the several functions, it reduces the effect of severe protracted exercise in accelerating the pulse. It increases the saliva, which, however, may be no more than the effect of mastication. It does not diminish the perspiration so far as I can judge. It probably lessens the hourly secretion of urine solids." Christison made no trials of its influence on disease orthe consequences of disease. It has been stated that the success of Weston as a pedestrian was due to his chewing coca, but in a letter to the 'Lancet' he states that he found it rather lessened than increased his strength; in fact, it acted as an opiate and forced him to sleep. Since the publication of the above results by Christison a series of most carefully conducted experimental observations on the properties and action of coca has been made by Mr. Dowdeswell in the Physiological Laboratory of University College, London. The results of these various trials are published by the author in the 'Lancet' for May 6th, 1876, and are thus summarised by himself: " These results, as far as they go, are negative, as many most competent to judge concluded that they would be; but contrary to the expectations of the writer, formed from published statements. It has been taken in all forms, solid and liquid, hot and cold, at all hours from 7 o'clock in the morning till 1 or 2 o'clock at night, fasting and after eating. In the course of a month nearly one pound of the leaves altogether has been consumed, but without producing any decided effect; it has not affected the

pupil nor the state of the skin; it has caused neither drowsiness nor sleeplessness; assuredly it has occasioned none of those subjective effects so fervidly described and ascribed to it by others—not the slightest excitement, nor even the feeling of buoyancy and exhilaration which is experienced from mountain air, or a draught of spring water. This examination was commenced in the expectation that the drug would prove important and interesting physiologically, and perhaps valuable as a therapeutical agent. This expectation has been disappointed. Without asserting that it is positively inert, it is concluded from these experiments that its action is so slight as to preclude the idea of its having any value either therapeutically or popularly; and it is the belief of the writer, from observation upon the effect on the pulse, &c., of tea, milk-and-water, and even plain water, hot, tepid, and cold, that such things may, at slightly different temperatures, produce a more decided effect than even large doses of coca if taken at about the temperature of the body. What its physiological action may be, particularly on the lower animals, in highly concentrated doses, as of the alkaloid or the distillate, is another question, as it is whether the subjective effects which have been asserted may not offer a question of curious nervous idiosyncrasies."

These results of Mr. Dowdeswell's would appear to set at rest the claims of coca as a therapeutical agent. Very recently, however, a writer in the 'Lancet' has again described it as a powerful nervine tonic, and recommends its use to sportsmen whose nervous system is badly adapted for steady shooting.

Voyage dans le Nord de Bolivie, &c., par Docteur Weddell (Paris, 1853); Johnston's Chemistry of Common Life, vol. ii, p. 138; Watts, Dict. Chem., vol. i, p. 1059; U. S. Disp., by W. & B., p. 1591; Weddell, in Pharm. Journ., vol. xiv, 1 ser., pp. 163 and 213; Mantegazza, in Pharm. Journ., vol. i, 2 ser., p. 616; Pharm. Journ., vol. i, 3 ser., p. 43; Simmonds, in Chemist and Druggist for April and May, 1876, pp. 112 and 155; Shuttleworth, in Canadian Pharm. Journ., Nov., 1874, and English Pharm. Journ., vol. v, 3 ser., p. 483; Amer. Journ. Pharm., March, 1861, p. 122, and Nov., 1861, p. 500; Journ. de Pharm., Avril, 1859, p. 283, and Juin, 1862, p. 522; Fuentes, Journ. de Pharm., 4 ser., vol. iv, p. 268; Reis, Bullet.

Gen. de Therap., Feb. 28, 1866, and Pharm. Journ., vol. viii, 2 ser., p. 299; Christison, in British Medical Journal, April 29, 1876, and Pharm. Journ., vol. vi, 3 ser., p. 883; Dowdeswell, in Lancet for April 29, 1876, p. 631, and May 6, p. 664.

DESCRIPTION OF PLATE.

Drawn from a specimen in the Royal Gardens, Kew, flowering in May; the fruit added from a specimen in the Kew herbarium collected in Bolivia.

1. A branch with young foliage and flowers.
2. A flower.
3. Petals.
4. Flower with petals removed.
5. Calyx and pistil.
6. Vertical, and—
7 and 8. Transverse section of ovary.
9, 10. Fruit.
11. Transverse section of the same.
12. Stipules.
13. Apex of leaf.

(2–8, 10–12 enlarged.)

D.Blair ad nat. del. et lith.

M & N. Hanhart imp.

CYTISUS SCOPARIUS, *Link.*

N. Ord. LEGUMINOSÆ. Lindl., Veg. K., p. 544 (*Fabaceæ*); Baill., Hist. Pl., ii; Le Maout & Dec., p. 365.

Tribe *Genisteæ*.

Genus Cytisus,* *Linn.* B. & H., Gen., i, p. 484; Baill., Hist. Pl., ii, p. 334. Species about 40, natives of Europe, N. Africa, and Western Asia.

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70. Cytisus scoparius,† *Link, Enum.*, ii, *p.* 241 (1822).

Broom.

Syn.—Spartium scoparium, *Linn.* Genista scoparia, *Lam.* Sarothamnus vulgaris, *Wimm.* S. scoparius, *Koch.*

Figures.—Woodville, t. 150; Steph. & Ch., t. 67; Hayne, ix, t. 10; Curt., Fl. Lond., fasc. 5; Syme, E. Bot., iii, t. 329; Le Maout and Dec., p. 311.

Description.—A bush of 4 or 5 feet in height, with a short stem reaching about 1½ inches in diameter, breaking up into very numerous erect branches, bark yellowish-green. Twigs very long and wand-like, erect, tough, blunt at the ends, which are pubescent and grow till killed back by the frost, dark-green, angular, with 5 prominent wings of leaflike character originating from the sides of the attachment of each leaf and passing down between them. Leaves alternate, evidently pentastichous, without stipules, small, the lower ones on longish flat stalks, trifoliate, the upper ones sessile, unifoliate, and apparently simple, leaflets sessile ¼—½ inch long, lanceolate or narrow obovate, subacute, entire, dark green and smooth or slightly hairy above, hairy below. Flowers numerous, large, solitary, on rather long smooth stalks in the axils of the sessile leaves, forming lax racemes. Calyx campanulate, laterally compressed, smooth, persistent, divided into 2 brown, scarious, shallow lips, the upper 2-, the lower 3-toothed. Petals 5, papilionaceous, wide-spreading, brilliant yellow, standard roundish, with a short claw, notched, the margin somewhat involute, wings oblong, keel

* *Cytisus*, in Greek κύτισος, the classical name for some leguminous shrub.

† *Scoparius*, a mediæval adjective, from *scopæ*, a broom.

as long as wings, blunt, at length turned downwards. Stamens 10, inserted at the base of the calyx, the filaments all united for some distance into a closed tube, their ends free, the 5 longer alternating with the 5 shorter, curved upwards, anthers small, 5 versatile and 5 sub-basifixed. Ovary sessile, compressed laterally, with dense silky hairs along each edge, style long, much curved upwards or even coiled into a ring, smooth, stigma terminal. Pod about 1½ inches long, oblong or linear-oblong, curved or nearly straight, with an apiculus at the end, much flattened, dark brown, smooth on the sides, with a fringe of long white hairs along the edge, valves separating with elasticity and becoming afterwards much twisted, smooth inside. Seeds about 12—18 in the pod, nearly sessile along the upper (ventral) suture, oblong-ovoid, slightly compressed, smooth and shining, olive-coloured, hard, the short funicle dilated into a thick two-lobed mass (strophiole) over the hilum; radicle thick, incumbent; endosperm scanty.

Habitat.—This familiar and beautiful shrub is very common throughout this country on heaths and open places, and in woods, often growing in great quantity and forming a marked feature in the vegetation of many sandy districts, especially noticeable in May and June when covered with its brilliant scented flowers. It is found in equal abundance throughout Western Europe, but becomes rare in the central and eastern parts, and in the Mediterranean countries. It, however, occurs in Italy and in Central and Southern Russia, extending even into Siberia.

The five prominent wing-like angles which give so striking a character to the young twigs are remarkably persistent, and can be traced on the very oldest stems; as the stem increases in thickness they become of course more widely separated, and at length appear as distant arching ridges, the summit of each arch marking the point of attachment of a leaf.

A pretty form with prostrate stems spreading in a circle is found on the cliffs of the west of France and England, where they are exposed to the winds and spray of the Atlantic Ocean.

A small quantity of endosperm is certainly present as a thin

layer lying on the sides of the cotyledons in the seeds of this species.

About five or six other species are referred to *Sarothamnus*, which is still maintained as a genus distinct from *Cytisus* by many botanists.

Syme, E. Bot., iii, p. 11; Hook. f., Stud. Fl., p. 87; Watson, Comp. Cyb. Br., p. 137; Gren. & Godr., Fl. France, i, p. 348; Ledebour, Fl. Ross., i, p. 515; Lindl., Fl. Med., p. 239; Flück. and Hanb., Pharmacogr., p. 148.

Official Part and Names.—Scoparii Cacumina; the fresh and dried tops of Sarothamnus scoparius, *Wimmer* (B. P.). The fresh and dried tops (I. P.). Scoparius; the tops of Sarothamnus scoparius (U. S. P.).

General Characters and Composition.—Broom tops are branched, straight, angular, dark green, smooth, and tough; their taste is bitter and nauseous; and in a fresh state they have a peculiar odour when bruised, but this is nearly lost in drying.

According to Stenhouse, broom tops contain two peculiar principles; one of which is neutral or somewhat acid, and has been termed *scoparin*, and the other a volatile liquid alkaloid, called *sparteine* or *spartia*. *Scoparin* is described by Stenhouse as crystallizing in stellate tufts of a yellow colour, readily soluble in water or alcohol, and without taste or smell. The experiments of Stenhouse lead to the belief that scoparin is the diuretic principle of broom tops; it does not appear to have any poisonous property. *Spartia* or *sparteine* is a colourless oily liquid at first, but it becomes brown by exposure to light. It is heavier than water, and but sparingly soluble in it; it is distinctly alkaline in its reactions, and forms extremely bitter crystallizable salts with acids. Like nicotia and conia it is destitute of oxygen. Stenhouse regarded spartia as a narcotic principle; it is very poisonous. Stenhouse also states that broom grown in the shade contains less spartia than that which flourishes in open sunny places; and he adds that shepherds are well acquainted with the narcotic properties of broom, from noticing that sheep after eating it become excited and stupified.

Medical Properties and Uses.—In large doses broom tops are emetic and purgative; and in small doses diuretic and laxative. Broom tops have long had a popular reputation in this country as a diuretic in dropsical affections; and are also regarded by the regular medical practitioner as one of the most serviceable remedies in such cases, more especially in dropsies depending on heart disease. The use of broom is contra-indicated in acute disease of the kidneys.

The seeds have similar properties to broom tops, and may be used in like cases. Scoparin has also been given as a diuretic in repeated doses of five grains; it is said not to produce any injurious effects.

The seeds of an allied plant—*Spartium junceum*, the Spanish Broom—have similar properties to the Common Broom. Its fibres have also been used from an early period in some parts of Southern Europe for cordage, and in the manufacture of a coarse kind of cloth for home use; and it has lately been much talked of in Italy, and a patent has been taken out for preparing the fibre.

Per. Mat. Med., by B. & R., p. 833; Pharmacographia, p. 149; U. S. Disp., by W. & B., p. 793; Gmelin's Chem., vol. xvi (1864), p. 282; Stenhouse, in Phil. Trans., 1851, pp. 422—431; Pharm. Journ., vol. ii, ser. 1, p. 36.

DESCRIPTION OF PLATE.

Drawn from specimens collected in the Isle of Wight by Mr. Stratton, and at Battersea, Surrey.

1. A flowering branch.
2. The standard.
3. Wing.
4. Keel.
5. Flower with the petals removed.
6. Pistil.
7. Diagram of flower.
8. A pod.
9. The same with the valves separated.
10. Seed.
11. Section of the same.

(10, 11, enlarged.)

P. Blair ad nat. del et lith.

M&N Hanhart imp.

N. Ord. Rosaceæ.
Tribe *Pruneæ*.
Genus Prunus, *Linn.*

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98. Prunus Laurocerasus,* *Linn., Sp. Plant., ed.* 1, *p.* 474 (1753).

Cherry-Laurel. Cherry-Bay. Common Laurel.

Syn.—Cerasus Lauro-cerasus, *Loisel.*

Figures.—Woodville, t. 185; Hayne, iv, t. 41; Steph. & Ch., t. 117; Nees, t. 318.

Description.—A shrub or small tree, sometimes reaching nearly 20 feet high, with spreading, slender branches, covered with smooth greyish-brown bark, young branches pale green, perfectly smooth and shining. Leaves evergreen, thick, coriaceous, alternate, on short, stout petioles, without stipules, oblong-ovate, 5—7 inches long, attenuated at both ends, and somewhat recurved at the apex, margin faintly but sharply and distinctly serrate, recurved, upper surface dark green, smooth, and polished, under surface much paler, dull, with a very prominent midrib, on either side of which at the base are one or two small, yellow, rounded, glandular depressions. Flowers about ½ inch wide, on smooth, spreading stalks, somewhat laxly arranged in stiff, erect, oblong racemes from the leaf-axils, bracts small, caducous. Calyx smooth, dark green, with a broadly urceolate tube, and 5 short triangular teeth. Petals 5, small, distantly inserted on the edge of the calyx tube, roundish, with a short claw, spreading, somewhat crumpled, white, reflexed, soon falling. Stamens 20, inserted in a double row on the margin of the calyx-tube, about as long as the petals, spreading, anthers small. Ovary superior, from the base of the calyx-tube, smooth, tapering into the style, 1-celled, with 2 ovules. Fruit a cherry-like drupe, about ⅝ inch in diameter, slightly narrowed at the apex, and with a faint

* *Laurocerasus*, a name given by Clusius, from the laurel-like foliage and cherry-like fruit.

furrow along one side, blue-black, smooth, shining, sarcocarp abundant, pulpy, endocarp hard, smooth, pointed at both ends. Seed solitary, with a thin testa and no endosperm, cotyledons large, plano-convex.

Habitat.—The well-known Laurel of the gardens is a native of the East, being found in woods in Thessaly, Bithynia, Armenia, Northern Persia, and the Caucasian provinces. It was introduced into Europe about 1580, and was known in English gardens very soon after, though it is not included in Gerard's Catalogue (1596) of his own garden. It very rapidly became an almost universally cultivated ornamental shrub, and is now found throughout temperate Europe, being only killed in very severe winters. The plant flowers here in May, and the handsome fruit is ripe in the autumn. Though individually quite like black cherries, their growth in pendulous racemose clusters gives them almost a grape-like appearance.

Clusius, Hist. Pl. Pannon. (1583), p. 1; Boiss., Fl. Orient., ii, p. 650; DC., Prod., ii, p. 450; Ledebour, Fl. Ross., ii, p. 9; Lindl., Fl. Med., p. 232.

Official Part and Name.—Laurocerasi Folia; the fresh leaves (B. P.). The leaves (I. P.). It is not official in the Pharmacopœia of the United States.

General Characters and Composition.—The fresh leaves, which are alone official in the British Pharmacopœia, are inodorous until they are bruised or torn, when they at once emit a ratafia or bitter almond odour. When chewed their taste is bitter, aromatic, and somewhat astringent. When dried their taste is still manifest; but they have no odour when bruised unless water be added, when their characteristic odour is at once evident.

The principal constituent of the leaves is supposed to be *amygdalin*, but this is rather inferred than proved, as that substance has never been obtained from them. They must also contain *emulsin* or some substance analogous to it, but no such constituent has, as yet, been isolated. The nature and reactions of amygdalin and emulsin are described under "Prunus Amygdalus."

The presence of these substances in cherry-laurel leaves is inferred from the fact that when they are cut and crushed and submitted to distillation with water, they yield a volatile oil which, like that produced under the same conditions from bitter almonds, contains hydrocyanic acid, and has always been regarded as identical with the essential oil of bitter almonds. According to Tilden, the crude essential oil of cherry-laurel leaves "consists mainly of *benzoic aldehyd*, accompanied with *hydrocyanic acid* (less than 2 per cent., according to Umney), *volatile oil*, possibly *benzoic alcohol* (perhaps 1 per cent.), and minute quantities of an *odorous resin*." The experiments of Schaer, made at the request of Dr. Flückiger, show that the fresh vigorous unwounded cherry-laurel leaves do not "evolve naturally a trace of hydrocyanic acid, though they yield it on the slightest puncture." According to Christison, the buds and unexpanded young leaves of the cherry-laurel yield ten times as much essential oil as the leaves of twelve months old. The experiments of Broeker also show, that the amount of hydrocyanic acid yielded by the leaves varies with the season, the age of the plant, the character of the soil, and of the weather. He found the proportion of the acid to be obtained from the leaves was greatest in July and August, and least in February.

Besides the above supposed constituents of the leaves, they contain *sugar*, *fat*, and a small quantity of *tannic acid*, hence their watery infusion becomes green by the addition of perchloride of iron.

Medical Properties and Uses.—Cherry-Laurel leaves have similar properties to hydrocyanic acid, and have sometimes been used both internally as a sedative; and externally in the form of a poultice mixed with linseed meal, as an application to painful ulcers, &c. But the official laurel water, which is more commonly and properly termed cherry-laurel water, is the usual form of administration, and is much employed in various parts of Europe. It is applicable in all cases for which hydrocyanic acid is used, and is sometimes regarded as an elegant mode of administering that acid. In this country and the United States its use has

been almost superseded by that of the more definite hydrocyanic acid, in consequence of its uncertain strength from the causes already mentioned, and also from the fact of its strength varying according to its age.

Cherry-Laurel water has been fraudulently used in Paris in the preparation of the cordial called *Kirsch*, in imitation of the genuine cherry cordial, which is so named.

The fresh leaves are sometimes used for flavouring sweetmeats, custards, creams, &c., but they should be employed with caution, as on account of their poisonous properties they may produce injurious, or even fatal effects.

Per. Mat. Med., by B. & R., p. 813; Pharmacographia, p. 226; U. S. Disp., by W. & B., pp. 522 and 1043; Christison's Dispensatory (1842), p. 592; Garot, Annuaire de Thérap., 1843, p. 45; Journ. de Pharm., Juillet, 1861, p. 15, Juin, 1864, p. 520, and vol. xvi, p. 346; Journ. de Pharm. et de Chim., 4 ser., vol. i, p. 33; Br. and For. Med.-Chir. Rev., Oct., 1868, p. 517; Umney, in Pharm. Journ., 3 ser., Jan., 1869; Tilden, in Pharm. Journ., 3 ser., vol. v, p. 761, and Year Book of Pharmacy (1875), p. 88.

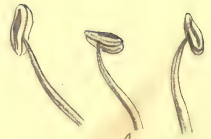
DESCRIPTION OF PLATE.

Drawn from a plant in the Royal Gardens, Kew; the fruit added from Nees and Hayne.

1. Portion of a flowering branch.
2. A flower.
3. Vertical section of the same.
4. Transverse section of ovary.
5. Cluster of ripe fruit.
6. A ripe fruit.
7. Same, with half the pulp removed.
8. The stone.
9. The same, with half the endocarp removed.
10. A seed.
11. Transverse, and—12. Vertical section of the same.

(2–4 enlarged.)

1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E.Blair ad nat. del. et lith

EUCALYPTUS GLOBULUS, *Labill.*

M&N.Hanhart imp

UNIV. OF
CALIFORNIA

N. Ord. MYRTACEÆ.

Tribe *Leptospermeæ*.

Genus Eucalyptus,* *L'Heritier*. B. & H., Gen., i, p. 707.
Species about 150, nearly all found in Australia.

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109. Eucalyptus Globulus,† *Labill., Voyage Rech. de La Pérouse*, i, *p.* 158 (1799).

Blue Gum-tree (Tasmania).

Figures.—Labillardière, Voy. Rech. de La Pérouse, Atlas, t. 13; F. Mueller, Plants indigenous to Colony of Victoria, Supp., t. 16.

Description.—One of the largest known trees, reaching occasionally to the gigantic height of over 300 feet, and not unfrequently to over 200 feet, and yet in some situations reduced to a dense bush. Trunk smooth, grey, the thick outer layers of the bark always easily peeling off, the young branches with 4 narrow herbaceous wings, smooth. Leaves on young plants opposite, decussate, with a short not twisted petiole, broadly ovate, with a cordate base and an acute apex, smooth, very pale, greenish-blue, almost white; on the full-grown tree alternate, with the petiole about an inch long, flattened above, and twisted half-way round, blade placed vertically with its flat surfaces lateral, 6—12 inches long, falcate, oblong-lanceolate, with a slightly tapering base, and a very much attenuated tapering apex, quite entire, smooth and shining, thick and leathery, with numerous immersed oil-glands, dull green, midrib prominent, pale, secondary veins regular, parallel, uniting with a continuous nerve which runs parallel with the margin, and at a little distance within it for the whole length. Flowers large, sessile, 2 or 3 closely crowded together, or solitary, on the expanded summit of a short, broad, much compressed, axillary peduncle; buds very glaucous, smooth, nearly half consisting of a large, thick, hemispherical, conical lid (operculum), covered

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* Name from *εὖ*, well, and *καλυπτός*, covered; in reference to the lid or operculum of the bud.

† *Globulus*, a little ball, from the button-like form of the fruit.

with irregular rounded prominences, which separates entire from the calyx-tube by a well-marked line of dehiscence at the flowering period. Calyx-tube broadly top-shaped or obconical, somewhat variable in form, more or less ribbed and worted externally, smooth, very glaucous, with numerous large globular oil-glands immersed in its substance, the edge prominent, truncate, smooth. Petals none in the expanded flower. Stamens very numerous, in several rows, inserted upon the edge of a smooth, thick, prominent, erect, green rim (disk) projecting above the line of dehiscence of the operculum; filaments long, delicate, spreading, the inner ones shorter, inflexed in the bud, cream-coloured, anthers small, ovate, with parallel cells, versatile, yellow. Ovary enclosed in the thick calyx-tube, and adherent to it throughout, flat on the top, 4- or 5-celled, with very numerous axile ovules, style short, rather thick, stigma entire. Fruit consisting of the enlarged calyx-tube and disk, which have become hard, woody, and brown, and the enclosed capsule, half-globular, the sides somewhat worted and more or less strongly 4 (or 5) ribbed, the top either nearly flat or somewhat convex, or with a very prominent central portion, nearly 1 inch wide, smooth, the rim (disk) projecting a little beyond the rest of the fruit, and separated from it by a narrow channel, capsule opening at the top by 4 (or 5) flat, hard, broadly triangular teeth. Seeds very numerous, many in each cell abortive, brown and variously shaped, but usually clavate-linear, fertile ones few, roundish-ovoid, black, about $\frac{1}{10}$ inch long, somewhat rough, not winged; embryo with large 2-lobed cotyledons folded over the straight radicle; no endosperm.

Habitat.—This very fine tree was first discovered in 1792 by the French botanist Labillardière, on the voyage in search of La Pérouse, in Van Diemen's Land, then called Cap de Diemen, and thought to be part of the Australian continent. It is abundant over the southern half of the island, *i. e.* not northwards of about sixty miles south of Launceston. Yet it grows abundantly in Flinders Island in Bass's Straits, and on the mainland of Australia is found in Victoria from Apollo Bay to Wilson's promontory, extending inland to the Buffalo range, and

ascending there into the colder altitudes. Valley-sides and the moist slopes of wooded hills are its favourite situations. It flowers in Tasmania in November and December.

The tree is now very familiar in Europe and America, and indeed throughout the world, having been of late years very extensively cultivated, especially in the Mediterranean region. Yet it was not introduced till 1856, when seeds were sent to Paris. Specimens may now be seen commonly enough in England, where, however, except perhaps in the West of Ireland and Cornwall, it cannot support the winter without shelter. Indeed, it is very sensitive to frost, and less hardy here than some other species of the genus, notwithstanding that its very restricted southern range in Australia would lead one to expect greater hardiness. It has flowered in the open air at Wexford. Throughout the south of Europe it flowers and fruits abundantly, producing ripe seed, but even there is sometimes cut off by frost. The growth of the plant is extraordinarily rapid both in height and girth of stem.

The remarkable structure to which the name of 'operculum' is given is usually considered to represent the petals, soldered together and much modified. In the present species and in many others there has been observed at an early stage a thin outer operculum, which soon falls away and is regarded as the limb of the calyx.

The fruit varies considerably; the typical button-shape is often departed from; and Baron von Mueller has described Australian varieties where it is also very much smoother and smaller than as above described.

Labillardière, Voy. La Pérouse, i, p. 151; DC., Prod., iii, p. 220; Hook. f., Fl. Tasmania, i, p. 133; F. Mueller, Fragmenta Fl. Austral., ii, p. 68; Benth., Fl. Austral., iii, p. 225.

Part Used and Name.—Eucalypti Folia; the leaves. They are not official in the British Pharmacopœia, the Pharmacopœia of India, or the Pharmacopœia of the United States.

General Characters and Composition.—The leaves, as noticed in our botanical description, vary in shape according to the age of

the tree. When used for medicinal purposes, the narrow, somewhat sickle-shaped ones, which are obtained from the full-grown tree, should alone be used, as it has been shown that these are more efficacious than the broader ovate leaves which are derived from the young plants. The fresh leaves are also more active than the dried. When fresh they have a bitterish, pungent, somewhat camphoraceous taste; and a peculiar, somewhat camphoraceous, cat-like odour, which is by no means agreeable when evolved from plants growing in a confined space.

The principal constituent of the leaves is a *volatile oil*, which may be readily obtained from them by distillation with water. This oil possesses in a marked degree the taste and peculiar odour of the leaves. When freshly distilled it has a yellow colour, but it becomes brown and resinifies by exposure to the air. According to Cloëz, it is dextrogyre; and its specific gravity as estimated by Homeyer, is 0·8762 at about 54°. Some years since Cloëz found that the principal constituent of this essential oil was a colourless liquid, boiling at 347°, and which he regarded as analogous to camphor, and to which he gave the name of *eucalyptol*. The more recent investigations of A. Faust and J. Homeyer have shown that this eucalyptol of Cloëz is a mixture of two hydrocarbons—a *terpene* and a *cymol*. They subsequently stated that the essential oil of Eucalyptus Globulus contained in addition to these two substances another terpene with a higher boiling point, and a substance containing oxygen; and in a still more recent investigation J. Homeyer has found the oil to be mainly composed of a *terpene* and *cymene*. He also obtained from it a small quantity of another terpene boiling at about 302° (the other terpene having a higher boiling point); and an oxidised substance, which the author has termed *eucalyptol*.

It was formerly imagined by some that eucalyptus leaves also contained quinia or some one or more of the other well-known alkaloids of Cinchona barks. But the experiments of Broughton the government quinologist of Ootacamund, entirely disprove this; for upon careful examination of the bark and leaves this chemist states

that neither quinia, nor any of the other alkaloids of Cinchona barks as quinidia, cinchonia, or cinchonidia, exist in the plant in any proportion. The properties of the leaves therefore, so far as is known at present, depend essentially upon the volatile oil.

Medical Properties and Uses.—So many medical practitioners have borne testimony to the febrifugal properties of the leaves—thus amongst others M. Pepin, Dr. Carlotti, Dr. Lorinser, Professor Gubler, Dr. Maclean, and Dr. Gimbert—that their value in the treatment of intermittent fever can scarcely be doubted. In Australia also, and in some other districts where the plant has been introduced, the leaves have long had a popular reputation in the treatment of fevers. Their anti-periodic properties are, however, far less manifest than those of the cinchona barks, and some of the exaggerated statements that have been made in reference to the efficiency of the leaves, appear to have arisen under the mistaken impression of their containing one or more of the alkaloids of those barks. The best form of administration, according to the opinions of the majority of practitioners, is the alcoholic tincture. Recently, Dr. Curnow has published two cases of ague successfully treated by the use of the tincture; and Dr. Fedeli, of Rome, has also lately testified to the remedial value of the various preparations of *Eucalyptus*, and especially of the alcoholic tincture, not only in cases of periodic fever and of palustral cachexia in general, but also in ailments of an atonic or anæmic character. Eucalyptus leaves have been likewise used as a stimulant and antispasmodic. The tincture and other preparations of the leaves have been also recommended for use in bronchitis; and in the form of cigarettes the leaves have been smoked, and are reputed when thus used to be efficacious in bronchitis, asthma, whooping-cough, and other diseases. An essence of eucalyptus employed in the form of an enema has also been used with success as a vermifuge. M. Gimbert has likewise recommended a new method of dressing wounds by using eucalyptus leaves instead of lint. The leaves are simply laid on the wounds; and it is said that their balsamic nature not only cures, but removes all the unpleasant

odour. It has been also stated that an excellent disinfectant may be made by adding from one to four ounces of eucalyptus oil to a bushel of deal sawdust. The experiments of Binz and Siegen prove that the antiseptic power of the eucalyptol of Cloëz is even greater than that of quinia.

When applied externally the volatile oil possesses rubefacient properties like cajuput oil, though far inferior to it. It has been used in this way in rheumatism, &c. The eucalyptol of Cloëz has also been employed for inhalation in bronchial and throat affections, one half to one teaspoonful being added to half a pint of water in the inhaler.

Besides the use of eucalyptus leaves in medicine the distilled oil of the leaves is employed together with that of several other species of Eucalyptus, as recommended by Mr. Rimmel, for diluting the more delicate essential oils; and in this way they are used for scenting soaps and other substances.

Other Products and Uses of the Eucalyptus globulus.—The bark is said to have similar properties to the leaves in the treatment of intermittent fevers, &c. It is also in use for tanning and dyeing purposes. Paper may likewise be made from this bark. This plant is also one of the many species of Eucalyptus from which exudes the very astringent substance, which from its resemblance to the official kino described under "Pterocarpus Marsupium," both in appearance and properties, is commonly designated *Australian, Botany Bay,* or *Eucalyptus Kino.* This product exudes from, and trickles down the bark of the tree in a semifluid state, but it ultimately hardens into dark red shining masses, which have a very astringent taste. It is employed for similar medicinal purposes as the official kino, and also for tanning and dyeing.

The timber of this and other species of Eucalyptus is remarkable for its solidity, hardness, and durability; and has great power in resisting the attacks of insects and the teredo, as also the influence of moisture. Moreover, this plant as recently noticed by Dr. Hooker, "seems to be proof against parasitic plants, the bark being deciduous causes the seeds of any

parasite to be dislodged before they have time to germinate and so obtain a footing in the tissues of the plant." So that in countries not too hot for its growth "its timber will probably turn out to be extremely useful." The great length of the planks that can be obtained from it is also another important element in its favour; thus, in many cases, planks of this wood have been cut of 160 feet in length, 20 inches broad, and 6 inches in thickness, and larger planks may be obtained. These qualities render the timber especially valuable for ship-building, railway sleepers, maritime works, and wherever beams of great span are required; as also for numerous other purposes.

Baron von Mueller has also shown that the ashes of the wood of this and other species of Eucalyptus contain a very large proportion of potash, in some cases as much as 21 per cent., so that this product must not be lost sight of among those obtainable from this plant.

But important as are the products obtainable from the *Eucalyptus Globulus*, it has been brought more especially into notice on account of the influence that plantations of this very rapid-growing tree are said to exert in improving miasmatic climates by destroying the paludal miasm, which causes fever in malarious districts; from which circumstance it has been called "the fever-destroying tree." The evidence that has been adduced from Australia, the native country of the tree, and from all parts of the world where it has been introduced, and which are favorable to its growth, in testimony of its anti-malarial properties, is so strong that, allowing for exaggeration in some cases, it can scarcely be doubted that this tree does produce a most beneficial effect by destroying the fever-producing miasm of marshy districts; and that it should consequently be introduced into all countries and districts where the climatic influences are favorable for its development, and where such miasmatic emanations are to be found. It has recently been planted to a large extent in Italy, and hopes are entertained "that in a few years malaria will be as effectively expelled from Italy as ague has been from Lincolnshire."

The influence of Eucalyptus trees in this respect is commonly regarded as being serviceable in two ways—first, by the far-spreading roots of this gigantic tree acting like a sponge, as it were, and thus pumping up water and draining the ground; and secondly, by emitting odorous and antiseptic emanations from its leaves. The more important influence is doubtless the power which the roots possess of absorbing water from the soil, so that when thickly planted in marshy places "the subsoil is drained in a little while as though by extensive piping;" but some influence is also exerted by the emanations from the leaves, which experiments have recently shown have marked antiseptic properties, and power of destroying the injurious effects of paludal miasm.

Gimbert, L'Eucalyptus Globulus, son importance en Agriculture, en Hygiene, et en Medicine, Paris, 1870, and Comptes Rendus, Oct. 6, 1873; Lorinser, Wiener med. Wochenschrift, vol. xix, p. 43, 1869, and vol. xx, p. 27; Gubler, Bulletin gén. de Therap., Aug. and Sept., 1871; Carlotti, L'Eucalyptus Globulus son rang parmi les Agents de la Matière Médicale, Ajaccio, 1872; Maclean, in Practitioner, Nov., 1871; Raveret-Wattel, L'Eucalyptus, Bulletin de la Société d'Acclimat., 1871–72; Bentley, Pamphlet on the Characters, Properties, and Uses of Eucalyptus Globulus, &c., and Abstract in Year Book of Pharmacy for 1874; Cloëz, Comptes Rendus, March 28, 1870; A. Faust and J. Homeyer, in Year Book of Pharmacy, 1874, p. 221, and for 1875, p. 57; Homeyer, in Journal of the Chemical Society, February, 1876; Garr., Mat. Med., p. 256; Pharmacographia, p. 174; Bosisto, in Pharm. Journ., vol. v, 3 ser., p. 270; Glover, in Pharm. Journ., vol. vi, 3 ser., p. 625, and Fedeli, vol. vi, 3 ser., p. 912; Proc. Amer. Pharm. Ass. (1875), p. 206; Curnow, in Lancet, Sept. 30, 1876; Maisch, in Amer. Journ. Pharm., 1876.

DESCRIPTION OF PLATE.

Drawn from a tree in the temperate house, Kew Gardens, flowering in May; the fruit added from von Mueller. 1. End of a flowering branch. 2. Vertical section of a flower. 3. Section of the raised disk. 4. Stamens. 5. Transverse section of ovary. 6. Fruit. 7. Transverse, and—8. Vertical section of the same. 9. A fertile seed. 10. Embryo. 11. Leaf of a young tree. (3, 4, and 7–10 enlarged.)

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N. Ord. RUBIACEÆ.

Tribe *Psychotrieæ*.

Genus Cephaelis,* *Swartz.* B. & H., ii, p. 127. Species about 70, all tropical, and chiefly American, but a few in the old world.

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145. Cephaelis Ipecacuanha,† *A. Rich., Hist. Nat. Ipec., p.* 21 (1820).

Ipecacuanha. Poaya (Brazil).

Syn.—C. emetica, *Pers.* Callicocca Ipecacuanha, *Brot.* Ipecacuanha officinalis, *Arruda.*

Figures.—Woodville, t. 274 and vol. 5; Hayne, viii, t. 20; Martius, Mat. Med. Brasil, tt. 1 and 8, cop. in Nees, t. 258; Trans. Linn. Soc. Lond., vi, t. 11, cop. in Steph. & Ch., t. 62; Berg and Sch., t. 15 c; Bot. Mag., t. 4063; St. Hil., Pl. Usuelles des Brasil, t. 6; Trans. Roy Soc., Edinb., xxvi, tt. 31, 32.

Description.—A half-shrubby perennial, roots several, spreading horizontally from their origin, at first slender and white, when fully grown about $\frac{1}{5}$ inch in diameter, long, scarcely branched, orange-brown, irregularly bent and twisted, covered with a very thick bark which is deeply and closely furrowed transversely along the whole length so as to form narrow rings. Stem more or less rhizomatous and rooting, or decumbent, or erect, not more than 18 inches long, woody, rounded, knotted and marked with leaf scars, smooth and grey at the base, quadrangular, pubescent, and green above, simple or slightly branched. Leaves few, somewhat crowded at the upper part of the stem, opposite, shortly stalked, stipules large, united at the base, where are several ovoid glands, persistent, adpressed to the stem, whitish, about as long as the petiole, deeply cut into four subulate laciniæ, blade 2—4 inches long or more, oval, acute or blunt at the apex, entire and more or

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* *Cephaelis*, from κεφαλή, a head, and ἐιλω, to collect, from the flowers being collected into a capitulum.

† *Ipecacuanha*, one of the Indian names for the plant, but applied also to several other plants, *e. g.* species of *Ionidium*.

less wavy on the margin, thick, with a few hairs on the edge, dark green and nearly smooth above, paler, somewhat pubescent and with prominent veins beneath. Flowers small, sessile, about 10—20 together, in a dense head supported on a cylindrical, pubescent, purplish, axillary but apparently terminal peduncle, at first erect, afterwards bent downwards, and surrounded by an involucre of four ovate, entire, downy, unequal bracts; a small acute pubescent bract accompanies each flower.[1] Calyx adherent, downy, the limb free, of 5 short, triangular-ovate, acute, irregularly toothed segments. Corolla funnel-shaped, hairy outside, white, tube much longer than the calyx-segments, slightly hairy within, limb shallowly cut into 5 ovate, pointed, spreading or somewhat reflexed lobes. Stamens 5, inserted at about the middle of the tube, filaments either very short so that the anthers are included in the tube of the corolla, or elongated so as to bring them up to its mouth, anthers 2-celled, linear-oblong. Ovary inferior, with a fleshy epigynous disk on the top, 2-celled, with a single erect ovule in each cell, style either short (to about the middle of the corolla tube) or long (exserted considerably beyond its mouth), stigma 2-lobed, papillose. Fruit several in a small cluster at the end of the reflexed peduncle, fleshy, smooth, shining, deep purple-violet, about ½ inch long or a little more, broadly ovoid, somewhat tapering or flattened at the top, where it is marked by the scars of the calyx-lobes, pulp whitish, pasty, enclosing 2 hard, stony pyrenes, convex on the outer surface, flattened on the inner, which is grooved from top to bottom. Seed solitary in each pyrene, and similar to it in form, testa membranous, embryo small, straight, at the base of the abundant horny endosperm.

Habitat.—This grows in abundance under the shade of trees in the hot moist forests of many parts of the vast empire of Brazil, occurring in clumps of numerous plants together. It has also been found in New Granada and probably in Bolivia. It was cultivated in this country at Edinburgh before 1832, and flowered at Glasgow in 1843.

The Ipecacuanha is a somwhat variable plant, differing in general habit, in the form and texture of the leaves, and the amount of

hairiness; its flowers are distinctly dimorphic, and for the abundant production of fruit it is necessary that a long-styled pistil be fertilised by pollen from the long stamens which occur in the flowers where the pistil has a short style; fertilisation has thus been artificially effected and ripe fruit produced at Edinburgh.

A remarkable point is the great facility with which even a very small portion of the singular annulated root is capable of producing adventitious buds. This fact was first observed in 1869 by Mr. McNab, Curator of the Edinburgh Botanical Gardens, and has proved of great utility by enabling a large number of young plants to be sent to India, where, in the Rungbi Valley, Sikkim, 3000 feet above the sea, a very extensive system of cultivation has been established. Even the leaf-petioles, if placed in suitable soil, are capable of producing buds and rootlets, and the plant has been propagated by this means also.

Aublet's genera *Tapogomea* and *Carapichea* are of older date than Richard's *Cephaëlis* (1775 against 1788), in which, however, they are now both included. Linnæus' *Ouragoga* is still older (1737), as from an examination of his imperfect specimen in the British Museum this is a *Cephaëlis* and probably the present species (see Linn. Hort. Cliffort., p. 486).

DC., Prod., iv, 535; Brotero, in Trans. Linn. Soc., vi (1802), p. 137; Lindl., Fl. Med., p. 442; Journ. Bot., 1872, p. 377; Balfour, in Trans. Roy. Soc. Edinb., xxvi (1872), p. 781, & Trans. Bot. Soc. Edinb., 1872, p. 151; Flück. & Hanb., Pharmacogr., p. 331.

Official Part and Names.—IPECACUANHA; the dried root (B. P.). The root (*Ipecacuanhæ Radix*) (I. P.). IPECACUANHA; the root (U. S. P.).

Collection, Preparation, and Commerce.—The roots of the Ipecacuanha plant are collected more or less all the year round, but less during the rainy season from the difficulty then experienced in drying them properly. The collectors are called *Poayeros* from the Brazilian name *Poaya* by which this plant is known. A Poayero collects the roots by grasping in one hand as many stems as he is able, and with the other he pushes a pointed stick obliquely with

a see-saw motion into the ground beneath the plants, by which he is able to pull up a lump of earth with the inclosed roots in an almost unbroken state. The earth is then shaken from the roots, which are placed in a bag brought for that purpose, and the same process is repeated with other plants. When the Poayero pulls up the roots, he breaks them at certain points, and from these broken parts of the roots which are left in the soil, young plants are subsequently produced, and thus the total destruction of the plant is prevented. In the evening the Poayeros put their collections together, and the roots are then spread out and dried as rapidly as possible by exposure to sunshine during the day, but they are protected from the heavy dew at night. After being perfectly dried, which process generally takes two or three days, the roots are broken up into pieces a few inches in length ; these are then shaken in a sieve to separate any remaining adherent earth ; and finally packed in bales for exportation. The annual imports of ipecacuanha into the United Kingdom may be estimated at about 65,000 lbs., representing a money value of nearly £15,000. It is principally imported into this country from Brazil ; but also to some extent from Carthagena.

General Characters and Composition.—Ipecacuanha or Ipecacuan is in more or less twisted, simple or branched pieces, usually from about two to four inches long, and ordinarily the size of a small writing quill, but smaller pieces may be frequently found. It consists of a slender central woody axis or meditullium of a whitish colour ; and a thick investing cortical portion, which has a brownish, reddish-brown, greyish-brown, or grey colour externally ; and is marked with irregular circular fissures, which sometimes extend to the woody axis, and thus give the roots the appearance of a number of rings strung upon a cord, and hence the name annulated ipecacuanha which is applied to this root and by which it is distinguished from the non-official ipecacuanhas. The cortical portion constitutes from 75 to 80 per cent. of the entire root ; it has a resinous or somewhat waxy fracture, and presents a semi-transparent horny appearance. The cortical portion is by far the more active portion of the root ; the woody axis being almost inert. Mixed

with the roots or attached to them are frequently found portions of the non-annulated, slender, subterranean stems; but these are very inferior to the roots. Ipecacuanha has a somewhat acrid and bitter taste; and when powdered a faint peculiar odour, which is peculiarly disagreeable to some persons, producing violent sneezing, cough, and a species of asthma. The powder has a pale brown colour.

The above characters apply more particularly to the drug as derived from Brazil, but of late years another variety of Ipecacuanha which is imported from Carthagena, and which is distinguished as *Carthagena* or *New Granada Ipecacuanha*, is sometimes to be found in the London market, and also in New York. It is distinguished by its larger size, less annulated character, and the distinctly radiated appearance of its woody axis or meditullium.

Ipecacuanha owes its properties essentially to a peculiar alkaloid called *emetia* or *emetine* which exists in the root in the proportion of about 1 per cent.; it is, however, principally contained in the cortical portion, the wood only exhibiting traces of its presence, hence the former, as already noticed, is the most active part of ipecacuanha. The other peculiar principles are *ipecacuanhic* or *cephaëlic acid*, and a trace of a *fœtid volatile oil*. A large amount of *starch* is also present in the root, and some other unimportant substances. *Emetia* is an amorphous, colourless, inodorous alkaloid, with a bitter taste. It is readily soluble in chloroform or alcohol, and also in acetic and other acids; but is only sparingly soluble in water, ether, and oils. *Ipecacuanhic acid* is a glucoside; it is a reddish-brown, amorphous, very deliquescent bitter substance, and is closely allied to kinic and caffetannic acids.

Adulterations and Substitutions.—Ipecacuanha is not, so far as we know, liable to be adulterated by admixture with other roots; but the greater proportion of the root which reaches the London market is more or less damaged by sea water or damp, and some samples also contain a very large quantity of the inferior, nearly smooth, non-annulated, woody stems. In a powdered state it has been adulterated with almond meal, which is readily detected by the development of hydrocyanic acid upon infusion in water.

Other emetic roots are also known in Brazil under the same name *Poaya* as that of the true ipecacuanha, and some of these spurious ipecacuanhas, as well as those of other countries, are occasionally forwarded to Europe and the United States. The kinds usually met with are the *Large Striated* or *Black Ipecacuanha*, from *Psychotria emetica* (Rubiaceæ), a native of New Granada; *Small Striated Ipecacuanha*, which, according to Planchon, is probably derived from a species of *Richardsonia*; and *Undulated Ipecacuanha*, from *Richardsonia scabra* (Rubiaceæ). All these are very inferior in their properties to the official Ipecacuanha, and may be readily distinguished from it by their non-annulated appearance and other well-marked characters.

Medical Properties and Uses.—In large medicinal doses ipecacuanha is emetic; in small doses expectorant and diaphoretic; and in intermediate doses nauseant. Locally applied to the skin it acts as a counter-irritant. From its stimulant action on the alimentary canal it has always been in repute as a remedy in chronic dysentery and diarrhœa; and in large doses of 30 grains and upwards it is regarded in India as almost a specific in acute dysentery. In very small doses it has been recommended by Dr. Ringer, in the vomiting of pregnancy; small doses are also often useful in atonic dyspepsia. As an expectorant it is in frequent use in catarrhs, chronic bronchitis, whooping-cough, and other pulmonary affections. As a diaphoretic it is generally combined with opium, which is generally supposed to increase its action, hence in the form of Dover's powder it is commonly employed in catarrhal, rheumatic, and neuralgic affections, and in other cases. On account of the sedative effect on the vascular system which follows its use as a nauseant, it is frequently serviceable in hæmorrhages, more especially in that from the uterus. As an emetic ipecacuanha acts with certainty and safety, and without depressing the system so much as tartar emetic. It is well adapted for children and delicate persons when our object is to remove crude and indigestible matters from the stomach. In febrile chest affections, as bronchitis, phthisis, and croup, it is especially valuable as an emetic. It does not act so speedily as sulphate of zinc or

even mustard; hence these substances are better adapted as emetics for evacuating the contents of the stomach in cases of poisoning.

Emetia has sometimes been employed, more especially on the Continent of Europe, as a substitute for ipecacuanha; but it presents no advantages over the crude drug, and its use might be followed by serious and even fatal consequences.

Per. Mat. Med., by B. & R., p. 703; Pharmacographia, p. 331; U. S. Disp., by W. & B., p. 494; Pharmacopœia of India, p. 115; Garr., Mat. Med., p. 285; Royle's Mat. Med., by J. Harley, p. 549; Gmelin's Chemistry, vol. xv (1862), p. 523; Balfour in Pharm. Journ., vol. ii, 3 ser., pp. 948 and 969; Pharm. Journ., 3 ser., vol. iv, p. 569; Amer. Journ. Pharm. vol. xxiii, p. 352, and vol. xxv, p. 474; Attfield, in Proc. Brit. Pharm. Conf. (1869), pp. 37—39; Pharm. Journ., 1 ser., vol. x, p. 608; Planchon, in Journ. de Pharm., vol. xvi, p. 404, and vol. xvii, p. 19; Duckworth, in St. Bartholomew's Hosp. Reports, vols. v and vii.

DESCRIPTION OF PLATE.

Drawn from a plant in the Royal Gardens, Kew, flowering in April; the fruit copied from Balfour.

1. Upper part of the plant.
2. Lower part and root.
3. Corolla laid open.
4. Section of ovary.
5. Ovary, calyx, and disk.
6. Cluster of fruit (from the short-styled plant).
7. Transverse section of a fruit.
8. A pyrene, ventral surface.
9. A seed.

(3—9 enlarged.)

D.Blair ad nat. del et lith.

M& N.Hanhart imp.

ROSMARINUS OFFICINALIS, *Linn.*

N. Ord. LABIATÆ.

Tribe *Monardeæ*.

Genus Rosmarinus,* *Linn.* B. & H., Gen., ii, p. 1197. The only species is the following.

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207. Rosmarinus officinalis, *Linn., Sp. Plant., ed.* 1, *p.* 23 (1753).

Rosemary.

Figures.—Woodville, t. 117; Hayne, vii, t. 25; Steph. & Ch., i, t. 24; Nees, t. 162; Berg & Sch., t. 10 c; Flora Græca, t. 14; Nees, Gen. Fl. Germ.; Jord. and Fourreau, Ic. Pl. Europ., tt. 101—103.

Description.—A small shrub attaining a height of about 4 feet, bushy and much branched, branches cylindrical, bark pale brown, fibrous, the young twigs tomentose. Leaves very numerous, evergreen, spreading, opposite, sessile, 1—1¼ inch long, oblong-linear, blunt at both ends, entire, with the margin strongly revolute, somewhat arched or drooping, thick, dark green and shining above, densely woolly with white stellate hairs beneath. Flowers rather large, shortly stalked, arranged in opposite pairs on short axillary racemose branches rather shorter than the leaves, bracts short, acute. Calyx tubular, wider above, deeply cut into 2 lips, the upper with 3 small teeth, the lower deeply bifid, more or less covered with a white stellate tomentum, internally smooth. Corolla with a short tube scarcely exceeding the calyx, strongly 2-lipped, the upper lip erect, oblong, cut into 2 lanceolate segments, the lower lip with 2 spreading oval lateral segments and a large dependent concave trifid central one with the lobes denticulate, slightly hairy externally, smooth within, pale dull blue, the lower lip spotted with purple and white. Stamens 2, filaments with a small reflexed tooth below the middle, anther-cells linear, coherent, dorsifixed; 2 small

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* *Rosmarinus*, or as two words, *Ros marinus* (literally sea-dew), the classical name for the plant.

staminodes representing the posterior stamens are sometimes present. Style tapering, exserted, exceeding the upper lip of the corolla, stigma bifid, the upper lobe very short. Achenes subglobose, smooth.

Habitat.—A native of the Mediterranean district, and common near the coast in warm dry hilly situations in the whole region from Spain to Asia Minor, being abundant in Northern Africa, and also reaching Madeira and the Canary Islands.

Rosemary is one of the most ancient of our garden plants, and still a favourite. It flowers in April and May, and is generally hardy through our winters. The wild plant is gathered for use in the South of France, North Italy, &c.

A remarkable variety from Algeria has much larger flowers on longer stalks, and a very glandular calyx.

Gren. & Godr., Fl. France, ii, p. 669; Willk. & Lange, Prod. Fl. Hisp., ii, p. 419; Benth., in DC. Prod., xii, p. 360; Lindl., Fl. Med., p. 489.

Official Parts and Names.—Oleum Rosmarini; the oil distilled from the flowering tops (B. P.). The oil obtained by distillation from the flowering tops (I. P.). Rosmarinus; the leaves (U. S. P.).

1. Rosmarinus. — The whole plant has a strong, peculiar, agreeable, aromatic odour, more especially the flowering tops; and a warm, bitterish, aromatic taste. The properties of rosemary are more or less impaired by drying; and if long kept the odour is entirely lost.

The principal constituents of rosemary are a *volatile oil,* upon which its properties essentially depend, *bitter matter,* and *tannic acid.*

2. Oleum Rosmarini. — *Production and Commerce.* Oil of Rosemary is directed in the British Pharmacopœia to be distilled from the flowering tops, and the same directions are given in the Pharmacopœia of India, but in the Pharmacopœia of the United States the leaves only are official as the source of the oil. Practically, nearly all the oil of commerce is distilled

from the stem and leaves in the summer months, and when the plant is not in flower; although some oil is obtained from the flowering tops, and is regarded as of superior quality to the former. The oil is principally derived from the South of France and the contiguous Italian Coast; but a good deal is also said to come by way of Trieste to France and Italy from Dalmatia. Scarcely any oil is distilled in England, but that so obtained is of fine quality. One pound of the fresh plant is stated to yield about one drachm of the oil.

General Characters and Composition.—Oil of Rosemary is colourless or pale yellow, with the peculiar odour of the plant, and a warm aromatic taste. Its specific gravity has been variously given, thus by Buignet and Kane at about 0·896, and by Gladstone at 0·908; it boils at 365°, is feebly dextrogyre, and is readily soluble in alcohol. According to Gladstone, it consists almost entirely of a hydrocarbon like that obtained from the volatile oil of the Common Myrtle; but Lallemand describes it as resolvable into two fluid portions—the one a very liquid hydrocarbon, boiling at 329°, and the other boiling between 392° and 410°, and depositing at a low temperature a large quantity of a stearoptene analogous to ordinary camphor.

Medical Properties and Uses.—Rosemary possesses stimulant and carminative properties; and has a popular reputation as an emmenagogue, but at the present day it is rarely employed in medical practice. It is said to be sometimes added to sternutatory powders. A weak infusion of the fresh leaves is occasionally used as a substitute for ordinary tea by hypochondriacal persons, and by dyspeptics. The admired flavour of Narbonne honey is ascribed to the bees feeding on the flowers of this plant.

The volatile oil of rosemary is a powerful stimulant and carminative. It is frequently used externally in combination with other substances as a stimulating liniment to promote the growth of the hair, for which it has a great popular reputation. It is also an ingredient in some rubefacient liniments. It is likewise used as an odoriferous adjunct to lotions and other external

applications; and is also occasionally given internally in hysteria, and nervous headaches.

Oil of rosemary is extensively employed in perfumery. It enters into the composition of "Eau de Cologne," and it is the principal ingredient in the once celebrated "Hungary Water."

Per. Mat. Med., vol. ii, pt. i, p. 520; Pharmacographia, p. 439; Steph. & Ch., Med. Bot., by Burnett, vol. i, pl. 24; U. S. Disp., by W. & B., pp. 743 and 1311; Gmelin's Chemistry, vol. xiv (1860), p. 397; Beckman's History of Inventions, by Johnston (1791), vol. ii, p. 107.

DESCRIPTION OF PLATE.

Drawn from a specimen in Kew Gardens.

1. A branch with flowers.
2. The calyx.
3. The corolla laid open.
4. Vertical section of calyx.
5. Section of ovary.

(2–5 enlarged.)

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D.Blair ad nat. del. et lith.

M&N.Hanhart imp.

LAURUS NOBILIS, *Linn.*

N. Ord. Lauraceæ.

Tribe *Laurineæ*.

Genus Laurus,* *Linn.* Meissner, in DC. Prod., xv, pt. 1, pp. 233–240. Species 2, one Mediterranean, the other Canarian.

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221. Laurus nobilis, *Linn., Sp. Plant., ed.* 1, *p.* 369 (1753).

Bay. Sweet Bay. True Laurel.

Figures.—Woodville, t. 235; Steph. & Ch., t. 125; Nees, t. 132; Hayne, xii, t. 18; Berg & Sch., t. 5 f; Fl. Græca, t. 365; Reichenb., Ic. Fl. Germ., xii, t. 673; Nees, Gen. Fl. Germ.

Description.—A much-branched shrub or small tree, sometimes reaching 25 feet or even more, with a smooth, olive-green or reddish bark, young twigs glabrous. Leaves very numerous, evergreen, alternate, without stipules, shortly stalked, 3—4 inches long, lanceolate, acute and tapering at both ends, the margin quite entire and usually more or less wavy, smooth, thick, shining, paler and strongly veined beneath, and covered with small immersed glands. Flowers unisexual, dicœcious, small, on smooth pedicels, arranged in small, umbellate, stalked clusters of (usually) 5, surrounded by an involucre of blunt, concave, reddish bracts, which enclose the umbel when in bud, peduncles stout, curved, a pair coming off opposite one another from a very short axillary branch. Male flowers:—perianth divided almost to the very base into 4 oval-oblong, broad, blunt, membranous, spreading, imbricate, yellowish-white divisions, minutely dotted with glands; stamens 12 in three rows of 4, smooth, the outer row alternating with the perianth-segments, a little longer than the rest, the other two rows with two small stalked, cordate, yellow "glands" near the base of the filaments; anthers oval, 2-celled, introrse, opening by valves which hinge at the top; no trace of a pistil. Female flowers:—perianth as in the male; androecium represented by 4 oblong, cordate, apiculate, stalked, fleshy, veined

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* *Laurus*, the classical name for the tree; in Greek, Δάφνη.

staminodes, varying in form, alternate with the perianth segments; ovary ovoid, about as long as the staminodes, one-celled, with a single pendulous ovule, style simple, cylindrical, a little shorter than the ovary, stigma thickened, faintly 3-lobed. Fruit succulent, ovoid, scarcely ¾ inch long, purplish-black, smooth, pulp scanty. Seed solitary, pendulous, the funicle running up one side to the summit, testa chartaceous, cotyledons large, plane-convex, oily, radicle small, included, superior; no endosperm.

Habitat.—The classical Bay is found wild in most parts of Asia Minor and Syria; it grows also throughout the countries surrounding the Mediterranean, and is abundant in Greece, Italy, and Southern France; it is, however, generally considered to have gradually spread from the East. In this country it is a garden plant, where it has been cultivated for centuries. Male trees are apparently much more frequent here than female. The flowers are copiously produced in early spring, and the nearly black sloe-like fruit is ripe in October and November.

The leaves vary a good deal in width and amount of crisping at the edges, and five varieties are distinguished by Meissner on these characters. Our figure represents them more undulated than is usual.

The name Laurel has been completely transferred from this to *Prunus Laurocerasus* (see No. 98). The word Bay commonly applied to the present tree is no doubt the same as the French *baie*, berry, and was originally used for the fruit, now tautologically called "Bay-berries."

Gren. & Godr., Fl. France, iii, 64; Bertoloni, Fl. Ital., iv, p. 399; Meissner, in DC. Prod., xv, 1, p. 233; Lindl., Fl. Med., p. 340.

Parts Used and Names.—Lauri Fructus et Folia; the fruit and leaves. They are not official in the British Pharmacopœia, or the Pharmacopœia of India, or the Pharmacopœia of the United States; but the fruits were formerly official in this country.

1. The Fruit.—The fruits which are commonly called *Bay Berries*, as seen in a dried state in commerce, are oval in form, and consist of a thin, brittle, blackish-brown, more or less wrinkled pericarp; enclosing a solitary, loose, firm, oval seed, which is

readily separated into two equal lobes. This seed has a bitter aromatic taste, and an agreeable aromatic odour. The fruits have been sometimes confounded with Cocculus Indicus, from which, however, they are readily distinguished, as described by us under *Anamirta paniculata.*

The properties of these fruits essentially depend upon a fragrant *volatile oil,* which may be obtained from them by distillation with water; and a *concrete fixed oil* of a greenish colour. The latter oil, which is known in commerce as *Oil of Bays,* is imported from the south of Europe. It may be obtained from either the fresh or dried fruits by expression and heat; but it is chiefly derived from the former. It is a mixture of volatile oil and fatty bodies, like the expressed oil of nutmeg described under *Myristica fragrans.* Oil of Bays has a butyraceous consistence, a greenish colour, and an aromatic odour, like that of the seeds. It is completely soluble in ether; but only partially so in cold alcohol.

2. The Leaves.—These have an agreeable aromatic odour; and an aromatic, bitterish, somewhat astringent taste. Their properties depend essentially upon the presence of a *volatile oil,* which is readily obtained from them by distillation with water. These leaves must not be confounded with those of the poisonous cherry-laurel already noticed under *Prunus Laurocerasus.*

Medical Properties and Uses.—Both leaves and fruits possess aromatic and stimulant properties, and have been reputed narcotic. The leaves are also said to be diaphoretic, and in large doses emetic. Both leaves and fruits were employed formerly in flatulent colic, hysteria, amenorrhœa, and other affections; but they are rarely or ever used internally at the present time, either in this country or elsewhere. Externally, however, the commercial oil of bays is sometimes employed as an external stimulant application in sprains, bruises, &c. But its principal use is in veterinary medicine.

The leaves are frequently used by the cook and confectioner as a flavouring agent. The volatile oil is also sometimes employed in perfumery.

Per. Mat. Med., vol. ii, pt. 1, p. 464; U. S. Disp., by W. & B., p. 1629; Steph. & Church., Med. Bot., by Burnett, vol. ii, pl. 125.

DESCRIPTION OF PLATE.

Drawn from a specimen in Kew Gardens, flowering in May; the female flower and fruit from a Corsican specimen in the British Museum.

1. Branch with flowers from a male plant.
2. The inflorescence.
3. A male flower.
4. Stamens.
5. A female flower.
6. Section of the same.
7. A staminode.
8. Ripe fruit.
9. Transverse section of the same.
10. Embryo with one cotyledon removed.

(2–7 enlarged.)

D Blair F L S ad nat del et lith.

M & N Hanhart imp.

PUNICA GRANATUM, *Linn*

N. Ord. LYTHRACEÆ.

Tribe *Granateæ*. Le Maout & Dec., p. 435 (*N. Ord.*).

Genus Punica,* *Linn.* B. & H., Gen., i, p. 784. There is but a single species.

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113. Punica Granatum,† *Linn., Sp. Plant., ed.* 1, *p.* 472 (1753).

Pomegranate.

Figures.—Woodville, t. 190; Hayne, x, t. 35; Steph. & Ch., t. 57; Nees, t. 301 (double fls.); Berg & Sch., t. 3 a, b; Wight, Illust. Ind. Bot., t. 97; Fl. Græca, t. 476; Bot. Mag., t. 1832; Fl. Brasil., fasc. 18, t. 8, 9 (evolution of flowers).

Description.—A bush or small tree 10—15 feet high, with straight, slender, somewhat angular branches, often with spiny ends, bark pale brownish-grey, furrowed longitudinally; the young shoots and buds red. Leaves usually opposite, sometimes alternate, often fascicled on the older branches, shortly stalked, without stipules, 1—2 inches long, oblong-ovate or lanceolate, tapering at both ends, quite entire, rather thick and stiff, perfectly smooth and shining, often persistent (half-evergreen). Flowers large, solitary or 2 or 3 together in the axils of the leaves near the end of the branches, very shortly stalked. Calyx large, broadly tubular, over $1\frac{1}{4}$ inch long, thick and leathery, adherent to the ovary below, cut into 5—7 thick, triangular, acute, valvate lobes above, smooth, shining, scarlet. Petals 5—7, inserted in the throat of the calyx and alternating with its lobes, spreading, imbricate, crumpled, roundish, with a short broad claw crimson. Stamens very numerous, free, inserted in several rows on the calyx-tube below the petals, crowded, erect; anthers ovoid, dorsifixed, 2-celled, introrse, yellow, dehiscing longitudinally. Ovary completely amalgamated with the lower part of the calyx-tube, thick and leathery, with two tiers of cells, the lower tier of 3 cells, the

* *Malus punica* (the Lybian or Carthaginean apple) was the Latin name of the tree; the Greeks called it ῥοιά.

† *Granatum* was also a classical name for the plant; from the numerous seeds (*grana*).

upper of 5—8 cells, ovules very numerous, sessile, covering the whole surface of the placentas which in the cells of the lower tier are axile, and in those of the upper tier parietal; style tapering; stigma simple, capitate. Fruit as large as an orange, 2½—3 inches or more in diameter, hard, depressed-globose, bluntly 5—8 angled over the position of the dissepiments, abruptly contracted at the top into a short neck terminated by the thick persistent calyx-lobes and containing the withered stamens; pericarp thin, nearly smooth, tough, yellow or reddish, cavity irregularly divided below the middle into two stories by a thin, somewhat conical diaphragm extending from the centre to the sides, upper story divided into 5—8 irregular cells by thin, tough membranous dissepiments, lower story often also with one or more vertical partitions. Seeds very numerous, entirely filling the fruit, attached in the upper cells on all sides of thick, strong, spongy placentas, which project from the wall, but do not extend to the top or bottom of the cells, and in the lower cell or cells either all over the floor of the fruit or on several irregular projecting placentas; each seed elongated, about ½ an inch long, variously polygonal from pressure, chiefly composed of a thick, translucent, pink, juicy coating, inner coat hard, white; embryo straight, radicle very short, cotyledons foliaceous, convolute; no endosperm.

Habitat.—As in the case of other plants cultivated from remote antiquity the native country of the Pomegranate is somewhat uncertain. It is, however, generally considered native in North Western India, Southern Persia, and perhaps Palestine, and to have been introduced at a distant period into the Mediterranean countries of Europe and Northern Africa, in which latter district, as its name indicates, it was once considered indigenous: it was also brought to China in very ancient times from Western Asia. At the present day this tree is spread over all the warmer and temperate countries of the globe; and in this country, into which it was introduced before the middle of the 16th century, it is much cultivated as an ornamental shrub for the sake of its very handsome flowers which are abundantly produced from June to

September. Fruit is also sometimes formed here, but it has very little flavour. The flowers are frequently double in gardens. A dwarf form, *P. nana*, Linn., with narrower leaves, is also cultivated, especially in the West Indies.

The structure of the ovary and fruit of the Pomegranate is quite anomalous, and thus the genus has no close allies. Many authors place it in *Myrtaceæ*, others make it an Order of itself; the authors of the "Genera Plantarum" place it (with a few others) as an anomalous genus at the end of the *Lythraceæ*.

DC. Prod., iii, p. 3; Boissier, Fl. Orient., ii, p. 736; Roxburgh, Fl. Ind., ii, 499; Lowe, Man. Fl. Madeira, i, p. 262; Lindl., Fl. Med., p. 74.

Official Parts and Names.—Granati Radicis Cortex; the dried bark of the root (B. P.). 1. The root-bark (*Granati Radicis Cortex*): 2. The dried rind or pericarp of the fruit (*Granati Cortex*) (I. P.). 1. Granati Radicis Cortex; the bark of the root: 2. Granati Fructûs Cortex; the rind of the fruit (U. S. P.).

1. Granati Radicis Cortex. *Pomegranate Root Bark.—General Characters, Commerce, and Composition.*—Pomegranate Root Bark as found in a dried state in commerce, is in quills or fragments, which are commonly three or four inches in length. It has a yellowish-grey colour externally; and its surface is wrinkled, or marked with faint longitudinal striæ, or furrowed from corky bands, which in the thickest pieces form broad flat exfoliating scales. Its inner surface is smooth or nearly so, of a yellow colour, and it has portions of the pale coloured wood frequently adhering to it. It breaks with a short fracture; has little or no odour; but a marked astringent, and very feebly bitter taste. For use in this country it is commonly obtained from the south of Europe; and is more especially collected in the south of France and in Italy.

The principal constituent of the bark is *tannic acid*, of which it contains about 22 per cent., and which, according to Rembold, is essentially a peculiar variety, and has been termed *punico-tannic acid*. Other constituents are *gallic acid* in small proportion, and

a large amount of *mannite*. An acrid uncrystallizable principle called *punicin* has also been indicated as a constituent by Righini; but some recent observers believe that this is only mannite. An infusion of the bark yields a deep blackish-blue precipitate with the solution of a persalt of iron; and its inner surface when moistened with water, and rubbed on paper, leaves a yellow stain, which, by the contact of sulphate of iron, becomes deep blue.

Adulterations and Substitutions.—Box bark and barberry bark are said to be sometimes substituted for, or mixed with, pomegranate root bark; but they may be readily distinguished from it by their infusions not being affected by the persalts of iron like that of pomegranate root bark. They have also an evident bitter taste which is not the case with pomegranate root bark.

The bark of the stem or branches is also frequently mixed with, or substituted for, the root bark; this may be readily distinguished by its less corky character. The stem bark is commonly regarded as less active than that of the root; but we have no record of experiments proving this.

Medical Properties and Uses.—The root bark has been occasionally used from a very early period as a vermifuge, for among other ancient writers, Celsus, Dioscorides, and Pliny, all refer to its value in this respect; but it was unknown in modern practice till it was again recommended for use by Drs. Buchanan, Anderson, Fleming, and others. Waring says it is very effectual for the destruction of tapeworm, and for this purpose he recommends the official decoction to be taken fasting; and to be followed by an aperient. The fresh root bark is used in India, and is commonly preferred; but Dr. De Vrij and others say that all real root bark, fresh or dried, and wherever collected, is efficacious. In this country the extract of male fern is generally regarded as a more efficacious remedy for the expulsion of tapeworm than pomegranate root bark. The bark is also sometimes used in chronic diarrhœa and dysentery.

2. Granati Cortex, or Granati Fructûs Cortex. *Pomegranate Rind.—General Characters and Composition.*—The dried rind is in irregular, more or less arched, hard, brittle fragments, some of

which have projecting from them the tubular calyx with the remains of the stamens and style enclosed. It is somewhat rough externally, and of a yellowish- or reddish-brown colour; internally it is pale yellow or brownish, and marked with depressions left by the seeds. It has no marked odour; but a very astringent and feebly bitter taste.

Like the root bark its principal constituent is *tannic acid*, of which it contains nearly 19 per cent.; hence its infusion produces a deep blue precipitate on the addition of a persalt of iron. Other constituents are *sugar*, and a little *gum*.

Medical Properties and Uses.—Pomegranate rind may be employed both externally and internally wherever astringents are indicated, but in this country its use is almost obsolete. It is, however, highly esteemed as a remedy for diarrhœa and chronic dysentery in India, where it is commonly combined with opium.

In those countries where the pomegranate tree is common, the rind has been employed in tanning leather.

3. Other Products of the Pomegranate Tree.—The ripe fruit is much esteemed in the East; and in this country it is frequently used at dessert. It may be also eaten as a slightly astringent and refreshing refrigerant in some febrile affections, especially those of the bilious type. In the East the juice of the fruit is much used in the preparation of cooling drinks. The seeds, leaves, and flowers of the pomegranate tree also possess astringent properties, and were employed by the ancients. The flowers are still used in the East, and were formerly official in the Dublin Pharmacopœia. They are termed *Balaustine flowers* or *Balaustines*; they have a fine red colour, and a slightly astringent taste; but no odour. They communicate a violet-red colour to the saliva. Their principal constituent is *tannic acid*. By the ancients they were employed in dyeing, as well as medicinally, for their astringent properties.

Per. Mat. Med., vol. ii, pt. 2, p. 241; Per. Mat. Med., by B. & R., p. 803; Pharmacographia, pp. 258–260; U. S. Disp., by W. & B., p. 438; Celsus de Medicina, lib. 4, cap. 17; Pharm. of India, p. 93; Year-Book of Pharmacy for 1874, p. 504; Journ.

de Pharm., 3e ser., vol. v, p. 298; Buchanan, in Edinb. Med. and Surg. Journ., vol. iii, p. 22; Debeaux, Pharmacie et Mat. Med. des Chinois, p. 70; Med.-Chir. Trans., vol. xi, p. 301.

DESCRIPTION OF PLATE.

Drawn from a plant in Chelsea Garden; the fruit added.

1. A branch with flowers.
2. Vertical section of flower, the petals removed.
3. Anthers.
4. Transverse section through upper tier of cells of ovary
5. Fruit.
6. Transverse section through upper story of the same.
7. Seeds as seen on a vertical section of fruit.
8. Transverse and—9. Vertical section of a seed deprived of the juicy covering.

(3, 4, 8, 9, enlarged.)

D.Blair, F.L.S. ad nat. del et lith.

M&N Hanhart imp.

FERULA GALBANIFLUA, *Boiss & Buhse.*

N. Ord. UMBELLIFERÆ.
Tribe *Peucedaneæ*.
Genus Ferula, *Linn.*

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128. Ferula galbaniflua, *Boiss. & Buhse in Nouv. Mém. Soc. Imp. Nat. de Moscou,* xii, *p.* 99 (1860).

Kassnih, Boridscheh (Persia).

Syn.—F. gummosa, *Boiss.* (1856). F. erubescens, *Boiss.* (1844), in part.

Not previously figured.

Description.—Root large, thickened below the neck, branched, sparingly filled with resinous juice. Stem 4 or 5 feet high, erect, an inch or more in diameter at the base, branched above, terete, striate, solid, exuding a white gum-resin which quickly becomes yellow on exposure to the air. Root-leaves 1½—2 feet long, with a slightly sheathing base and long petiole, greyish, covered with a fine down, outline broadly triangular, very compound; the primary divisions 3, on very long stalks, rhomboidal in outline and bipinnate, with the pinnæ opposite and distant, ultimate leaflets very small, not ½ an inch long, ovate, pinnatifid or bipinnatifid, with the segments linear, bluntish, divaricate, entire, and more or less collected into a bunch; cauline leaves reduced to a very small multifid tufted limb terminating an oblong, acute, membranous, veined, tomentose, not swollen, sheathing petiole, deciduous. Flowers polygamous; umbels of fertile flowers terminal, those of male flowers lateral, on long stalks which overtop the fertile umbel; rays 6—14, thickened at both ends, pedicels slender, general involucre absent, partial either absent or represented by a few small lanceolate bracts. Calyx-segments obsolete. Petals linear-lanceolate, rather acute, entire, with an incurved apex, pale yellow, smooth. Filaments long. Fruit on stalks about ⅕ of an inch long, greatly compressed, elliptic-oblong or slightly obovate in outline, blunt at both ends, ½ to nearly ¾ of an inch long, ¼ to nearly ⅜ wide, crowned with

the short stiffly reflexed styles, mericarps surrounded by a thin flat wing, varying in width from not more than $\frac{1}{6}$ to quite $\frac{1}{4}$ the whole width of the fruit, greyish-yellow, smooth, ribs very slender, prominent, vittæ solitary in each groove, wide, swollen, in the commissure either absent,* or more frequently two, small and narrow. Embryo small, with ovate blunt cotyledons. (We have not seen the flowers, the above description of them is taken from the writings of M. Boissier, quoted below.)

Habitat.—This plant was originally found by Dr. Buhse in 1847 or 1848 at the foot and on the slopes, between 4000 and 8000 feet, of Demavend, a mountain to the north-east of Teheran, Northern Persia, and on the neighbouring hills at Kuschkäk and Churchurä, flowering and fruiting in June. What is considered by Boissier to be the same plant was also collected in 1858 by Bunge, near Sebsewar, between Schahrud and Nischapur, in Khorassan. This latter, of which we have seen only ripe fruit and dry stems, appears to be more robust than Buhse's plant, from which it also slightly differs in the larger and more orange-coloured mericarps, which are rather obovate and twisted, and possess a wider wing and invariably (?) 2 narrow vittæ in the commissure; the specimens are covered with the exuded yellow gum-resin abundantly. For examples of both plants we are indebted to the courtesy of M. Boissier, of Geneva.

Ferula rubricaulis, Boiss., is, according to Borszczow, also a source of Galbanum. This plant has been collected in the Kuhdaëna mountains of South Persia by Kotschy, and in Dalmkuh in Northern Persia by Aucher-Eloy, and, no doubt, occurs elsewhere in the same country. It is drawn from authentic specimens in Berg and Schmidt's work, t. 31 b, under the name *F. erubescens*, Boiss. Boissier places it in a different section (*Scorodosma*) of the genus *Ferula* to the plant above described, in consequence of the vittæ being indistinct and numerous instead of solitary in the grooves; the petals are also somewhat broader, oblong-ovate or oval. Borszczow, on the contrary, unites the

* M. Boissier describes the commissure as without vittæ in this species; but this is far from constantly the case in the fruits examined by us.

two, and they are certainly very nearly allied. Indeed, Boissier's discarded species, *F. crubescens*, was made up of specimens some of which he now refers to *F. rubricaulis* and others to *F. galbaniflua*, var. β. *Aucheri*. This latter variety, collected in Persia by Aucher-Eloy (no. 3658), though it certainly has the vittæ of the species to which it is now referred, possesses leaves with the wider segments of *F. rubricaulis*, as figured in Berg's plate. It was to Aucher-Eloy's plant that the name *F. gummosa* was formerly given by Boissier.

These two plants no doubt afford the great bulk of Persian Galbanum, but *Ferula Schaïr*, Borszczow, a native of the desert regions of the Syr-Darja (River Syr), on the confines of Siberia and Turkestan, is also a source of the drug. It was met with in 1859 near Lake Kotschkan-Ssu, and is said to grow abundantly about 3 miles further eastward. A tenacious milky juice was observed to exude from the cut stem which had completely the odour of Galbanum, and the scent was so strong as to be observed at a considerable distance. This plant is finely illustrated in Borszczow's memoir quoted below, tt. 6—8.*

The *Galbanum officinale* of Don (Trans. Linn. Soc., xvi (1833), p. 603), founded on fruits sticking to the drug, cannot be certainly determined. The fruits were clearly not those of the Galbanum plant, and are thought by Bentham to come near *Polylophium*. Lindley's *Opoïdia galbanifera*, collected by Sir J. McNeill in Khorassan in 1838 (Bot. Register, 1839, app. p. 66), has not been identified, but is considered by the same authority to be probably some species of *Peucedanum*.

Buhse, in Bulletin Soc. Imp. Nat. de Moscou, xxiii (1850), p. 548, and Nouv. Mém. Soc. Imp. Nat. Mosc., xii (1860), p. 99; Boissier, in Ann. des Sc. Nat., ser. 3, i, p. 316, Diagnoses Plant., nov. Or., ser. 2, fasc. 2, p. 92, and Flora Orientalis, ii, pp. 989 and 995; Borszczow, in Mem. Acad. Imp. Sciences, St. Petersbourg, iii (1860-61), p. 33.

Official Part and Names.—GALBANUM; a gum-resin, derived from an unascertained umbelliferous plant (B. P.). A gum-resin

* Bentham & Hook. f. (Gen. i, p. 920) refer it to *Peucedanum* (sect. *Diplotænia*).

from Ferula galbaniflua, *Buhse* (I. P.). GALBANUM; the gum-resin of an undetermined plant (U. S. P.).

Collection and Commerce.—According to Geoffroy, galbanum is usually obtained by making an incision into the stalks a little above the root, from which it issues in a fluid state in drops, but in a few hours it becomes dry and hard enough to gather. Landerer also says that it is obtained by making an incision into the plant, under which a mussel shell is placed to collect the juice as it exudes. E. Hirschsohn in a recent memoir, from the fact that most kinds of commercial galbanum contain pieces of root, likewise expresses his belief that it is obtained by incision of the root, and collection of the exuded juice after it has hardened. Buhse, however, states that the inhabitants of the district he visited, do not incise the plant at all, but that the juice, which is milk-white in colour, exudes spontaneously from the stem, particularly near its base, and at the points of insertion of the leaves. The juice soon concretes into tears, which are at first milk-white like it, but ultimately, by exposure to light and air, assume a yellow colour. It seems probable, therefore, that the collection may vary in different districts.

Some galbanum is stated to be exported by way of Bombay; but it is principally obtained from the Levant, and a large quantity is said by Ludwig to reach Russia by Astrachan and Orenburg, or according to Goebel by Nishnei-Novgorod and Astrachan. That which comes to us by way of Bombay and the Levant is the ordinary kind seen in this country, and is considered by Martiny to be a distinct variety from that which reaches Russia by Astrachan. The former he terms Levant Galbanum, the latter Persian Galbanum.

General Characters, Varieties, and Composition.—The ordinary Galbanum, which is sometimes known as Levant Galbanum, is found in commerce in the two forms of tear and mass; the latter variety being by far the more common. *Galbanum in tear* occurs in distinct roundish or irregular-shaped tears, which vary in size from a lentil to that of a hazel nut, although rarely exceeding

that of a pea; the tears are of a light yellowish-brown, orange-brown, or yellowish-green colour; more or less translucent, usually rough on their surface, hard and brittle in cold weather, but softening in summer, and by the heat of the hand becoming ductile and sticky. The tears are frequently found in a more or less agglutinated state. *Galbanum in mass* usually occurs in large, hard, compact, irregularly-shaped masses, which are commonly of a yellowish-brown or dark brownish-yellow colour, or occasionally they have a greenish tint; these masses are composed of more or less agglutinated tears, and generally contain a variable proportion of the fruits of the galbanum plant, with pieces of the root, stem, and other impurities. Galbanum is separated from its impurities by being melted and strained. In rare cases galbanum is found in a soft, almost fluid state. This latter, which is sometimes regarded as a distinct kind under the name of Persian Galbanum, has a strong peculiar odour, which has been supposed to have some resemblance to a mixture of garlic and savin; and a disagreeable, bitter, somewhat acrid and alliaceous taste.

Galbanum contains about 60 per cent. of *resin*, 33 of *gum* or *mucilage*, and 7 of *volatile oil*; it is therefore a *gum-resin*. The *resin* has a soft consistence, and is soluble in ether or alkaline liquids; it yields by the action of heat and hydrochloric acid, nearly 1 per cent. of the substance termed *umbelliferone*, which may be separated from the acid solution by means of ether or chloroform in which it is soluble; and by subsequent evaporation of these solutions it can be obtained in colourless crystals of an acicular form. *Umbelliferone*, as is noticed in treating of assafœtida and ammoniacum, is also obtainable in small proportion from these drugs. Umbelliferone is likewise soluble in water, and the solution displays a blueish fluorescence, which is rendered much more manifest by the addition of an alkali, but is destroyed by an acid. That umbelliferone exists pre-formed in galbanum is proved by the blue fluorescence being at once evident when a drop of ammonia is added to water in which a piece of galbanum has been immersed for a short time. Amongst other substances also obtainable from galbanum resin, may be mentioned a thick

oil of an intensely blue colour, and which is said to be identical with the blue oil derived from the flowers of *Matricaria Chamomilla*, L.; and *resorcin*. It is probably from the formation of this latter substance that galbanum, or its resin, develops a red colour when warmed with concentrated hydrochloric acid. By this test galbanum may be distinguished from both assafœtida and ammoniacum, for, according to Flückiger and Hanbury, when assafœtida is treated in the same way, it "assumes a dingy greenish colour, and ammoniacum is not altered at all." The *volatile oil of galbanum* is a colourless dextrogyrate liquid, with the odour of the drug, and boiling at a temperature of from 320° to 329°. Nothing definite is known of the gum or mucilage of galbanum; it is said to be perfectly similar to gum arabic.

Medical Properties and Uses.—In its action galbanum is intermediate between assafœtida and ammoniacum, but it is much less used than either of these gum-resins. As an antispasmodic it is far less powerful than assafœtida; but in its stimulating expectorant properties it is allied to ammoniacum. It is frequently given in combination with assafœtida, as in the official compound assafœtida pill, which possesses stimulant and antispasmodic properties, and is useful in hysteria, chlorosis, &c. Galbanum has also been regarded as a useful internal remedy in chronic mucous catarrh, in amenorrhœa, and chronic rheumatism. It is applied externally in the form of galbanum plaster, as a mild stimulant in promoting the resolution or suppuration of indolent tumours; and to the chest in chronic pulmonary affections.

Galbanum entered into the composition of the incense in use by the ancient Jews, and is still employed for a similar purpose by the Catholic Apostolic Church.

Exodus xxx, 34.

Per. Mat. Med., vol. ii, pt. 2, p. 188; Pharmacographia, p. 286; U. S. Disp., by W. & B., p. 413; Geoffroy, Trait. de Mat. Med., vol. ii, p. 623; Buhse, in Bulletin. de la Soc. Imp. des Nat. de Moscou, vol. xxiii (1850), p. 548, and in Ph. Jl., vol. xi, ser. 1, p. 577; Gmelin's Chemistry, vol. xi, p. 228; Pharm. Jl., vol. iii, ser. 2, p. 428; Hirschsohn, in Pharm. Jl., vol. vii, ser. 3, pp. 369, 389, and 429.

DESCRIPTION OF PLATE.

Drawn from a specimen collected by Buhse in Persia (no. 1137), kindly communicated by M. Boissier.

1. Umbel of ripe fruit, with withered umbels of barren flowers.
2. A fruit.
3. Back, and—4. Commissural face of a mericarp.
5. Section of a mericarp.
6. One of the three primary divisions of a lower leaf.
7. An ultimate leaflet.

(3, 4, 5, 7 enlarged.)

Stanford

D.Blair F.L.S. ad nat. del. et lith.

M&N Hanhart im

ACHILLÆA MILLEFOLIUM, *Linn.*

N. Ord. Compositæ,

Tribe *Anthemideæ*.

Genus Achillea,* *Linn.* B. & H., Gen., ii, p. 419. Species 100, natives of the northern hemisphere, especially of the old world.

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153. Achillea Millefolium,† *Linn., Sp. Plant., ed.* 1, *p.* 899 (1753).

Yarrow. Milfoil.

Syn.—A. setacea, *Waldst. & Kit.*

Figures.—Woodville, t. 15; Nees, 246; Hayne, ix, t. 45; Berg & Sch., t. 19 a; Curt., Fl. Lond., fasc. 6; Syme, E. Bot., v, t. 727 (bad), Reichenb., Ic. Fl. Germ., xvi, t. 1026.

Description.—A perennial herb with a slender creeping root-stock, giving off numerous filiform roots, and several long subterranean, reddish stolons with a blunt succulent scale at each node. Flowering stem erect, 3—18 inches high, stiff, slightly striate, more or less covered with short, white, shaggy hairs, slightly branched above. Leaves alternate, the radical ones often 6 inches long, stalked, with a wide petiole, lanceolate-oblong in outline, the cauline ones much smaller, sessile and oblong, all very deeply bi- or tri-pinnatisect with closely placed, overlapping segments which are again cut into linear, very acute lobes, more or less hairy. Heads small, stalked, numerous, ovoid, erect, crowded, forming together a more or less flat-topped corymbose inflorescence at the ends of the stem and branches, bracts none, or a few linear ones; involucral scales in 2 or 3 rows, strongly imbricate, oblong, blunt, strongly keeled, pale green, with a narrow pale-brown scarious margin; receptacle slightly convex, set with oblong, transparent scales. Disk flowers bisexual, about 8—12; calyx-limb obsolete; corolla tubular, slightly inflated

* *Achillea*, ἀχίλλειος, was the classical name of some aromatic composite plant, named after Achilles, who was said to have discovered its properties.

† *Millefolium*, the name for the plant in the middle ages; from its multifid leaves.

above, 5-toothed, with a few glands on the exterior, yellow; anther-cells without tails at the base, slightly projecting beyond the corolla. Ray flowers about 5, female; corolla ligulate, the limb short, almost circular, slightly 3-lobed, reflexed, white or pinkish; style exserted, stigma bifid, with recurved truncate branches, brush-like at the end. Fruit compressed, smooth, shining, without any crown or pappus.

Habitat.—One of the commonest of our wild plants, in dry meadows, and on heaths, downs, waste ground, and roadsides, almost everywhere throughout this country. Abroad it has a wide distribution throughout Europe, Western Asia, and North America, and extends into the Arctic regions of both hemispheres and to the Himalayas. It flowers from July till late in the autumn. The size of the heads and the amount of woolliness is liable to considerable variation, and the ray flowers are not unfrequently pink or a fine rose-colour, or even purplish in some garden varieties. In alpine localities it is very dwarf and stunted.

The leaves, though so deeply divided, are usually simple, a very narrow band running down either side of the midrib.

Syme, E. Bot., v, p. 57; Hook. f. Stud. Fl., p. 201; Watson, Comp. Cyb. Br., p. 237; Gren. & Godr., ii, p. 162; Ledebour, Fl. Ross., ii, p. 531; A. Gray, Man. Bot. U. States, p. 265.

Official Part and Names.—ACHILLEA, *Yarrow;* the leaves and flowering tops (U. S. P. *Secondary*). It is not official in the British Pharmacopœia, or the Pharmacopœia of India. But the leaves and flowers were formerly official in the Edinburgh Pharmacopœia.

General Characters and Composition.—The leaves, flowering tops, and herb generally, have, when fresh, an agreeable and somewhat aromatic odour, which they retain in a great degree if carefully dried; and a bitterish, aromatic, and slightly astringent taste. The aromatic properties are most marked in the flowers, and the astringent and bitter qualities in the leaves. According to Griffith, the plant, which has become naturalised in the northern

and middle States of America, has more active properties than that found in Europe.

Yarrow has been analysed by Sprengel, Ch. C. Sears, and Zanon, and its principal constituents, have been found to be a *volatile oil*, a *bitter principle* called *achilleine*, an acid termed *achilleic acid*, and *tannin*. Its properties are more especially due to the volatile oil, achilleine, and tannic acid. The oil may be readily obtained by distilling the flowering herb with water; it has a beautiful blue colour, and the odour of the plant.

Medical Properties and Uses.—The properties of yarrow are those of a mild aromatic tonic and astringent. In former times it had a high reputation as a vulnerary, hence its common English name of *Nose-bleed*, and its French name *Herbe aux Charpentiers*. In some parts of Sweden, according to Linneus, it was employed instead of hops in the preparation of beer, which it was thought to render more intoxicating. At present it is but very rarely used in European practice, but its introduction of late years into the Pharmacopœia of the United States will probably lead to its properties being again tested; and from recent testimony it would appear to be more especially valuable as an emmenagogue; as a local application and internal remedy in hæmorrhoidal affections; and in certain atonic conditions of the bladder which are attended with discharges. It is said to be "especially useful in correcting the involuntary discharge of urine in children." It has also been employed in intermittent fevers; and as an antispasmodic in flatulence, colic, and nervous affections. The bitter principle (*achilleine*) has also been recommended as an antiperiodic. The best form for administering yarrow is as an infusion, which may be prepared by macerating an ounce of the leaves and flowering tops in a pint of water; this may be given in doses of a wineglassful or more. The volatile oil may also be employed in doses of from ten to thirty drops.

Gerarde's Herball, by Johnson (1636), p. 1073; Miller's Gard. Dict., vol. i, pt. 1; Griffith's Med. Bot., p. 403; Linneus, Flor. Suec., p. 299; U. S. Disp., by W. & B., p. 17; Watts' Dict. Chem., vol. i, p. 36; Porcher's Med. Bot. of South

Carolina, p. 796; Waring in Pharm. Journ., ser. 2, vol. v, p. 504; Proc. Amer. Pharm. Assoc. (1862), p. 113; Journ. de Pharm. et de Chem., vol. xviii, p. 62; Bullet. Gen. de Therap. (1857); Liebig, Annalen., lib. 8, p. 21 (1847).

DESCRIPTION OF PLATE.

Drawn from a specimen gathered at Barnes, Surrey.

1. Upper part, and—2. Lower part of a plant.
3. A head.
4. Section of the same.
5. A ray flower.
6. Stigmas.
7. A disk flower with bract.
8. Section of the same.
9. An anther.

(3—9 enlarged.)

Biblioteca

D.Blair F.L.S. ad nat. del et lith.

M & N. Hanhart

LACTUCA VIROSA, *Linn.*

N. Ord. COMPOSITÆ.

Tribe *Cichoriaceæ*.

Genus Lactuca,* *Linn.* B. & H., Gen., ii, p. 524. Species over 60; inhabitants of the northern hemisphere of both old and new worlds.

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160. Lactuca virosa,† *Linn., Sp. Plant., ed.* 1, p. 795 (1753).

Wild Lettuce.

Figures.—Woodville, t. 31; Steph. & Ch., t. 12; Nees, t. 250; Syme, E. Bot., v, t. 805; Reichenb., Ic. Fl. Germ., xix, t. 1422.

Description.—A biennial herb with a brown tap-root. Stem 2—6 feet high, erect, cylindrical, with short horizontal branches in the upper part, glabrous, but with small scattered prickles chiefly in the lower part, pale glaucous green, often spotted or tinged with purple. Radical leaves numerous, very large, 6—18 inches long, obovate-oblong, entire, narrowed at the base; stem-leaves few, much smaller, alternate, spreading horizontally, sessile, oblong, acute at the apex, prolonged at the base (especially the upper ones) into two deflexed, rounded, or subacute amplexicaul auricles; margin with irregular spinous denticulations, glabrous, pale glaucous green, the midrib spiny beneath. Heads numerous, shortly stalked, small, $\frac{1}{2}$—$\frac{3}{4}$ inch wide, with several small amplexicaul acute bracts below, arranged in short, stalked, spicate cymes on the divaricate branches, the whole forming a very large lax ovate panicle; involucre oblong, the scales few, imbricated in two or three rows, narrow, glabrous, glaucous green tinged with purple; receptacle flat, naked; flowers few in each head, all bisexual. Corolla strap-shaped, pale yellow, the limb minutely 5-toothed at the end. Anthers with a broad tongue at the apex and two rather long tails at the base. Style hairy above, bifid, with two slender recurved papillose arms; ovary constricted into a short

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* *Lactuca*, the classical Latin name, from the milk-like juice.

† *Virosa*, poisonous; not particularly applicable, but probably originating from the juice having the odour of opium.

neck below the pappus. Fruit oval, strongly compressed, with a broad wing along the edge and 8 slender ribs on each face, rough, almost black, prolonged above into a white beak as long as itself, expanded at the top and carrying the spreading silvery pappus, hairs simple, denticulate.

Habitat.—This kind of Wild Lettuce is not uncommon in England, especially in the south-eastern counties, growing in hedges and on banks, where its large radical leaves are very conspicuous; the flowers, which appear in August, are only fully expanded in the morning sunshine. The plant grows also throughout western and southern Europe, and extends eastwards to Western Siberia.

The whole plant is traversed by milk-vessels, and the slightest puncture, especially of the young branches or involucral scales, causes an instant copious outflow of the white latex, which on exposure soon becomes brown and solid.

Syme, E. Bot., v, p. 145; Hook. f., Stud. Fl., p. 214; Watson, Cyb. Br., p. 210; Gren. & Godr., Fl. France, ii, p. 320; Ledebour, Fl. Ross., ii, p. 805; Lindl., Fl. Med., p. 469.

Official Part and Name.—LACTUCA, *Lettuce;* the flowering herb (B. P.). The flowering herb (I. P.). It is not official in the Pharmacopœia of the United States; its place being there taken by the Garden Lettuce, *Lactuca sativa*, L.

General Characters and Composition.—The whole herb, especially during the period of flowering, abounds in a white milky juice, which instantly exudes when the plant is wounded. This juice has a bitter taste, and a strong opiate-like odour. When the juice is excluded from the air in closely-stopped bottles it undergoes little change; but when exposed to the air it quickly hardens, and assumes a brownish colour, and then constitutes what is termed *lactucarium*. This substance is described by us under "Lactuca sativa," which is also one of its sources. Lactucarium is official in the Pharmacopœia of the United States, but its place is supplied in the British Pharmacopœia, and in the Pharmacopœia of India, by the extract of Lettuce, which is directed to be prepared from the species of *Lactuca* now under description.

The milky juice when fresh reddens litmus paper, and is coagulated both by acids and alcohol. The more important constituents are doubtless those contained in Lactucarium, namely, *lactucerin* or *lactucone*, *lactucin*, and *lactucic acid*; these substances are described under the head of Lactucarium in our article on "Lactuca sativa." The juice also contains a small quantity of a *volatile oil*, to which its odour is due, *albumen*, *resin*, and several *salts*.

Medical Properties and Uses. — This plant has long had a reputation for narcotic properties, but the experiments of Dr. Garrod, who gave lactucarium—which is commonly reputed to be the most active preparation of the plant—in doses of thirty grains and more, repeated every four hours, without observing any very marked narcotic effects from its administration, clearly prove that its powers, if any, must be very slight indeed. The official extract is, however, sometimes given as a mild hypnotic where the use of opium is objectionable, to procure sleep, allay cough, &c. It is also said to be slightly laxative, antispasmodic, and diuretic; and has been employed more especially in Germany, in dropsy. But in the treatment of dropsy, lettuce has been generally combined with squill, digitalis, or some other well-known diuretic, hence it is probable that the observed effect in such cases is essentially due to the latter drugs. It has also been used as a remedy in palpitation of the heart, in intermittent fever, and in other cases, but although it was formerly highly spoken of by practitioners, it is now regarded as useless in such cases.

Per. Mat. Med., vol. ii, pt. 2, p. 36; Pharmacographia, p. 354; U. S. Disp., by W. & B., pp. 517 & 521; Garr., Mat. Med., p. 296; Woodville's Med. Bot., Supplement (1794), p. 100; Steph. & Church., Med. Bot., by Burnett, vol. i, pl. 12; Buchner's Repertorium (1847), 8.

DESCRIPTION OF PLATE.

Drawn from a specimen grown in Chelsea Garden. 1. The flowering plant (much reduced). 2. A branch with flowers. 3. A head. 4. The same in section. 5. A single flower. 6. Portion of a hair of the pappus. 7. Anther. 8. Style. 9. Head of fruit. 10, 11. A single fruit. 12. Vertical, and—13. Horizontal section of the same. (3—9 & 11—13 enlarged.)

D Blair, F.L.S. ad nat. del. et lith

M & N Hanhart imp.

RHEUM OFFICINALE, *Baill.*

THE NEW
ZEALAND

N. Ord. Polygonaceæ.

Tribe *Rhabarbareæ*.

Genus Rheum,* *Linn.* Meisner, in DC. Prod., xiv, pp. 32—37. Species 20 or more, natives of Northern Asia, China, Persia, and the Himalayas.

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213. Rheum officinale, *Baillon in Adansonia*, x, *p.* 246 (1872).

Thibetan Rhubarb.

Figures.—Rep. de l'Association Française, 1872, t. 10, reprod. in Adansonia, xi, tt. 8, 9; Bot. Mag., t. 6135 (Dec., 1874); Neues Repert. für Pharmacie, xxv (1876).

Description.—A large, perennial, herbaceous or semi-fruticose plant, possessing after the first two or three years of its life (according to Baillon) a very thick aërial stem persisting through the winter, with branches about 10—16 inches long, as thick as a man's thigh, suddenly tapering to a blunt apex and covered externally with a dark brown coat formed of the dried and withered, closely-placed leaf-bases and ocreas of former years, many of which have leaf-buds in their axils, internally fleshy or semi-pulpy, with a yellowish or orange-coloured juice; the lower part of the stem giving off large, thick, adventitious roots. Lower leaves very large, closely placed, alternate, on very long petioles, stipulate, spreading on all sides, at first reddish; petioles about 18 inches long, widely dilated at the base, nearly cylindrical above, about 1½ inch thick, solid, perfectly glabrous or pubescent with very short white hairs, longitudinally striate, bright green; stipules (ocreæ) very large, membranous, at first obovoid, entire, afterwards orange-brown and torn; blade from 2—4½ feet long, and somewhat more wide, suborbicular, palmately-veined, with 5—7 nearly equal, shallow lobes, base cordate or reniform, margin irregularly and coarsely cut, veins thick, very prominent beneath, much reticulated, upper surface smooth, pale clear green, under surface paler, covered with a fine white pubescence; upper leaves few, distant on the

* *Rheum*, in Greek ῥῆον or ῥᾶ, was the name of the drug in classical times.

flowering-branches, shortly stalked or nearly sessile, very much smaller, somewhat triangular, more deeply cut. Flowering-branches several, reaching a height of 5—8 feet or more, hollow, green, thick, striate, nearly smooth, terminating in the much-branched inflorescence. Flowers small, about $\frac{1}{4}$ of an inch long, on slender drooping pedicels somewhat exceeding them in length, which are thickened at the end and have an articulation a little below the middle, arranged in clusters of 7—10, with a single, small, orange-coloured bract at the base; clusters densely crowded on all sides of the axis, and together forming a stalked, cylindrical, drooping, catkin-like inflorescence, tapering to a point; these terminate the divaricate cylindrical branchlets of the flowering-stems and the whole forms an elegant pyramidal head or compound panicle; branches of the inflorescence striate, densely pilose, with crowded short hairs on the ribs, buds globular; larger bracts early deciduous. Perianth-leaves 6, hypogynous, obovate-oblong, blunt, nearly glabrous, very slightly connected below, pale greenish-white with whiter borders, imbricate in two rows, nearly equal, the 3 inner somewhat longer, concave, never spreading. Stamens 9, hypogynous, about as long as the perianth, 3 opposite each of the inner perianth-leaves, the central one of each 3 somewhat longer than the others, and apparently forming an inner row, anthers ovate-oblong, innate, pale lemon-yellow. Disk large and prominent, surrounding the base of the ovary, consisting of 9 fleshy, blunt, bright and shining, dark green lobes alternating with the stamens, distinct or variously united; ovary not half the length of the stamens, 3-sided, tapering, smooth, pale green, 1-celled; styles 3, spreading or reflexed; stigma large, capitate, reflexed over the edges of the ovary, pink. Fruit in small clusters, about $\frac{1}{2}$ an inch long by somewhat over $\frac{1}{4}$ of an inch broad, pendulous, on stalks about $\frac{2}{3}$ their length which disarticulate below the middle, surrounded at the base by the persistent, slightly enlarged, purplish perianth-leaves, triangular in section and tapering, but with a large wing at each angle much wider at the apex than the base, so that the shape of each face is broadly oblong; wing cordate at the base and apex,

brilliant crimson-red, with many close transverse veins and a strong longitudinal intramarginal rib; pericarp very thin, papery, transparent, yellow, with two large channels or vittæ along the centre of each side filled with a dark yellow liquid with a resinous odour and staining properties. Seed solitary, erect, testa exceedingly thin, united with the pericarp; embryo small, with a superior radicle and oval cotyledons, lying in the axis of the dense, tough but milky endosperm.

Habitat.—All that is certainly known about this fine species of *Rheum*, which no doubt is the source of at least a portion of the Rhubarb of commerce, is that in 1867 the "Société d'Acclimatation" at Paris received from M. Dabry, French Consul, a large consignment of roots professing to be those of the true official Rhubarb. They had come to him through a missionary at Set-chuan, who probably had obtained them from a Chinese, and there is no doubt that they were collected in the south-eastern part of Thibet near the Chinese frontier. The plant is said to grow wild and also to be cultivated there, and it probably extends into China itself, but whether it grows in the districts, Sui-tschuan, Schensi, and Kansu, from which the best rhubarb is now obtained, is not known. The whole on its arrival at Paris appeared to be one putrifying mass, but by a piece of good fortune a few of the globular axillary buds retained sufficient vitality when placed under favorable conditions to put out adventitious roots, and ultimately a plant was raised. Of this after some years' cultivation in the botanic garden of the Faculty of Medicine in Paris, M. Baillon, in 1872, gave a full description and from this source all the plants now existing in Europe have been derived.

In this country it was first grown in 1873, by the late D. Hanbury, who also sent specimens to Mr. Usher, of Banbury (who commenced the cultivation of the plant for medicinal use), to Kew, and to other gardens. These flowered in 1874, and since then it has been to some extent grown as an ornamental plant, and from its extremely handsome character will, no doubt, as it is quite hardy and readily propagated, become common in gardens.

It flowers in May and June, and the fruit is ripe at the end of July.

As a species this is very distinct from the rest of the genus, *R. palmatum* being its nearest ally. From *R. hybridum*, Murr., it is quite different. The form of the leaves is very characteristic, and unlike any other species, these are very handsome, and when young somewhat remind one of the castor-oil plant; the petiole is completely without any groove on the upper surface, and the exterior border of the two lowest ribs is entirely bare for some distance from the petiole. The figure of the fruit in the 'Bot. Magazine' is incorrect both in form and colour.

In the above description of the stem Baillon's full account has been followed. He has had the opportunity of examining plants of greater age than any yet grown here. The latter have not developed any decidedly aërial stem, nothing more than a crown of a few inches high. Mr. Usher, after three years' cultivation, has not observed any tendency towards the formation of a further stem, though the increase in bulk of the little offset he received in 1873, of about an inch in diameter, was very great, the central portion attaining a weight of 13 pounds. We are indebted to him for a specimen of the root prepared for the market, and we agree with Prof. Flückiger, of Strasburg, who has also examined a similar specimen and himself grown the plant at Strasburg, that it possesses the appearance of the true Rhubarb, especially in the presence of the zone of numerous star-like spots formed by the fibro-vascular bundles. Further cultivation will show whether the stem becomes as much developed as is described by Baillon, or whether it be anything more than a large root-stock which from its vigorous growth is somewhat more elevated above the surface of the ground than in other species.

Baillon, in Rep. de Congrès (Association Française) de Bordeaux, 1872, pp. 514—549, abstracted in Journ. Bot., 1872, p. 379, & reprinted in Adansonia, xi, p. 219; Flückiger, in Neues Repert. für Pharmacie, bd. xxv, heft 1, p. 1 (1876), abstracted in Pharm. Journ., 1876, p. 861; Journ. Bot., 1875, p. 239.

Official Part and Names.—Rhei Radix; the dried root deprived of the bark, from one or more undetermined species of Rheum, *Linn.* (B. P.). The dried decorticated root (I. P.). Rheum; the root of *Rheum palmatum*, and other species of Rheum, from China, Chinese Tartary, and Thibet (U. S. P.).

It will be seen from our botanical description, and also from the above extracts from the British Pharmacopœia, and the Pharmacopœias of India and the United States, that the botanical source of the official rhubarb is not yet absolutely proved, although it seems clear that it is derived, in part at least, from this species; hence all particulars as to the Collection, Commerce, General Characters, Composition, Medical Properties, and Uses of this drug, are reserved by us until we treat of *Rheum palmatum*, which the more reliable information of former writers, as well as the recent travels of Lieut.-Colonel N. Prejevalsky in Mongolia, prove to be another source of Chinese rhubarb, and probably that from which our best commercial specimens are derived. But that *Rheum officinale* does also yield a kind of rhubarb having some of the marked characters of true Chinese rhubarb we have proved by the examination of a specimen of the root of this plant cultivated in this country by Mr. Usher, of Bodicott, near Banbury. The characters of this rhubarb are more fully described under *Rheum palmatum*.

Pharmacographia, p. 442; Per. Mat. Med., by B. & R., p. 568; Pharm. Journ., vol. iii, ser. 3, p. 301; L'Union Pharmaceutique, vol. xv, p. 21; Pharm. Journ., vol. iv, ser. 3, p. 690, and vol. vi, p. 861.

DESCRIPTION OF PLATE.

Drawn from a plant in Kew Gardens, flowering in May; the fruit from a plant in the garden of the Royal Botanic Society, Regent's Park.

1. A plant in flower (about $\frac{1}{10}$ nat. size). 2. Portion of the inflorescence. 3. A flower. 4. Vertical section of the same. 5. Diagram of the same. 6. A spike of ripe fruit. 7. A single fruit. 8. Vertical, and—9. Transverse section of the same.

(3—5 and 7—9 enlarged.)

J. Blair F.L.S. ad nat. del. et lith.

M & N. Hanhart imp.

ARISTOLOCHIA SERPENTARIA, *Linn.*

N. Ord. ARISTOLOCHIACEÆ. Lindl. Veg. Kingd., p. 792; Le Maout & Dec., p. 705.

Genus Aristolochia, *Linn.** Duchartre in DC. Prod., xv, pt. i, pp. 432—498. Species over 180, found in the warmer countries throughout the world.

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246. Aristolochia Serpentaria,† *Linn., Sp. Plant., ed.* 1, *p.* 961 (1753).

Virginian Snakeroot.

Syn.—A. officinalis, *Nees.* A. sagittata, *Muhl.* A. hastata, *Nutt.* Endodeca Bartonii, *Klotzsch.* E. Serpentaria, *Klotzsch.*

Figures.—Woodville, t. 59; Bigelow, t. 49; Barton, t. 28, copied in Hayne, ix, t. 21; Steph. & Ch., t. 180; Nees, t. 143; Berg & Sch., t. 25 a.

Description.—A perennial herb, with a short horizontal rhizome giving off very numerous long, slender, crowded roots below. Flowering stems about a foot high, branched at the base, slender, cylindrical, flexuous or ziczac, pubescent, purple below. Leaves few, on the upper part of the stem, alternate, stalked, without stipules, two or three inches long, usually ovate-attenuate, with a cordate base, sometimes narrower and oblong or even linear, entire, minutely pubescent, especially when young. Flowers few, solitary, not an inch long, on rather long, filiform, flexuous stalks, which come off horizontally from the axils of small scales at the lower nodes of the stem, curved downwards at the ends, with several distant bractlets at intervals. Perianth adherent to the ovary (superior), tubular, hairy on the outside, smooth within, tough, dark brownish-purple, deciduous, the tube cylindrical, inflated above the ovary, then much narrowed, then again inflated, and finally narrowed at the mouth, which is turned upwards, the

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* *Aristolochia, ἀριστολοχία*, the classical name for *A. Clematitis* and *A. rotunda*, from their supposed virtues.

† The *Serpentaria virginiana* of Plukenet (1691), from its use in snake-bites.

limb vertical, flat, obscurely 3-lobed. Stamens epigynous, filaments fused with the style, anthers 6, 2-celled, apparently sessile and adnate to the under surface of the stigma, two under each of its lobes, dehiscing vertically. Ovary inferior, ovoid-pyriform, bluntly 6-angled, covered with short reflexed hairs, 3-celled, with a double row of ovules attached to the axile placentas; styles combined into a short thick column; stigma large, divided into 3 broad, flat, truncate lobes. Fruit a small dry capsule, partially dehiscent septicidally, flattened above, 6-angled, 6-celled, pericarp thin, papery, smooth, dark brown. Seeds several in each cell, bluntly triangular, very flat, convex and somewhat warted on the lower surface with the margin inflexed, hollowed on the upper surface, where it is traversed across the centre by the thick, white, fleshy raphe, embryo very small at the end next the hilum, endosperm abundant, densely fleshy.

Habitat.—A native of the United States of America growing in moist fertile woods in all except the most Northern States, but not generally a very common plant. It flowers in June and July, the singular blossoms being more or less buried in the loose soil and dead leaves near the root; the seeds are ripe at the end of September. It was grown in an English garden so far back as 1632. There is a plant in cultivation at Kew, but it has not flowered there.

The genus *Endodeca* was defined by Klotzsch from this species, which he divided into three; it possesses, however, no characters distinguishing it from *Aristolochia*.

The great variation in the form of the leaves has caused the creation of several supposed species. Barton's figure above quoted is the variety *Bartonii* of Duchartre, *Endodeca Bartonii*, Klotzsch, *Aristolochia officinalis*, Nees.

An allied species, *A. reticulata*, Nutt, native to the Western United States, yields the Texan or Red River Snakeroot.

A. Gray, Man. Bot. N. U. St., p. 404; Chapman, Fl. South. States, p. 272; Lindl., Fl. Med., p. 343; Duchartre, in DC. Prod., xv, i, p. 433; Klotzsch, in Monatsbericht der K. Akad., Berlin, 1859, pp. 575, 600.

Official Part and Names.—SERPENTARIÆ RADIX; the dried rhizome (B. P.). The dried root (I. P.). SERPENTARIA; the root of Aristolochia Serpentaria, of Aristolochia reticulata, and of other species of Aristolochia (U. S. P.).

Collection and Commerce.—Serpentary rhizome, Serpentary root, or as it is also termed Virginian Snakeroot, is principally collected in Western Pennsylvania and Virginia, but also in Ohio, Indiana, and Kentucky. It is commonly imported into this country in bales, casks, or bags, from New York and Boston.

General Characters and Composition.—The so-called Snake-root or Serpentary root of commerce consists in reality of the rhizome and of a tuft of numerous small roots arising from its lower surface. The rhizome presents a twisted and knotty appearance; it is usually about an inch in length, by about one eighth of an inch in thickness, and is marked on its upper surface by the short projecting bases of the aërial stems which it once bore. In some cases we also find attached to the rhizome longer portions of the herbaceous stem, together with leaves, flowers, and fruit. From the under surface of the rhizome numerous slender branched rootlets arise, varying from 2 to 4 inches long, and forming together a compact interlacing tuft. Serpentary has a yellowish or brownish colour; a bitterish, aromatic, somewhat valerianaceous and camphoraceous taste; and a strong, aromatic, not unpleasant odour, resembling a mixture of valerian and camphor.

The principal constituents of serpentary root are, a *volatile oil* in the proportion of about ½ per cent. and a *bitter principle.* The volatile oil has the odour of the root, and the bitter principle (*aristolochin*), which was first made known by Chevallier, is described as an amorphous substance of a yellow colour, a bitter and slightly acrid taste, and as soluble in both water and alcohol. It requires further investigation. The medicinal properties of serpentaria are doubtless essentially, if not entirely, due, to these two substances. But serpentary root also contains *tannic acid, resin, mucilage, sugar,* and some other unimportant ingredients.

Substitutions and Adulterations.—In the United States the

rhizomes and rootlets of other species of Aristolochia, more especially those of *Aristolochia reticulata*, Nutt, are sometimes substituted for the serpentary root derived from Aristolochia Serpentaria; indeed, these parts of *Aristolochia reticulata* are official in the Pharmacopœia of the United States. This serpentary root closely resembles the old serpentary root in odour and taste, although it is somewhat less aromatic; and also in appearance, except that the rhizome is a little thicker, and the rootlets less matted together. Should any of the leaves, however, be mixed with this root they are at once a distinguishing character, being nearly sessile, leathery in texture, and evidently reticulated on their lower surface. This Serpentary root is commonly known as *Texan* or *Red River* Snakeroot. Examined by Mr. Thomas Wiegand, of the United States, it was found to have essentially the same chemical composition as the true serpentary root. The rhizomes and rootlets of other species of *Aristolochia*, as, for instance, those of *A. hirsuta*, Muhl, are also said to be sometimes mixed with the rhizomes and rootlets of *A. Serpentaria*.

Various other roots and rhizomes are also occasionally substituted for, or mixed with, serpentary root, either fraudulently or by accident, such as the roots of *Spigelia marilandica*, L., the rhizomes of *Cypripedium pubescens*, L., and of *Hydrastis canadensis*, L.; and the roots of *Panax quinquefolium*, L. These are all readily distinguished from Serpentary root if only ordinary care be exercised, as their characters are very different from it, and need, therefore, no further notice from us.

Medical Properties and Uses.—As its common and specific names of Snakeroot and Serpentaria imply, Serpentary had formerly a high reputation for the cure of the bites of venomous serpents; indeed, it was first introduced into regular medical practice as a remedy in such cases, but like all the so-called specifics of vegetable origin which have been introduced for destroying the effects caused by venomous reptiles it is no longer regarded as of any remedial value. As a stimulant, tonic, diaphoretic, and diuretic, it is, however, a medicine of some repute; but in too large doses it causes nausea, flatulency, griping

pains in the bowels, and tendency to diarrhœa. It has been extensively employed in typhus and typhoid fevers; and has also been highly recommended in intermittent fevers; but in the latter it is commonly given as an adjunct to bark or sulphate of quinia, whose effects it is said to increase in a marked degree. It has likewise been employed as an antidote against the bite of a mad dog, but it has no more value in destroying the effects in such a case than as a remedy in the bites of venomous reptiles. It is, however, used with good results in diphtheria, chronic rheumatism, atonic dyspepsia, and in exanthematous diseases to promote eruption. A strong infusion is also reputed to be serviceable as a gargle in malignant sore throat. Garrod states, that from observations made during many years, he "is inclined to think that serpentary is a remedy of some considerable power, acting in a manner not unlike Guaiacum in stimulating the capillary circulation, and promoting recovery in chronic forms of gouty inflammation; and as it does not disturb the bowels, it may often be administered when Guaiacum is not easily tolerated."

Gerarde's Herball, by Johnson (1632), p. 849; Dale's Pharmacologia (1693); Steph. & Church., Med. Bot. by Burnett, vol. iii, pl. 180; Per. Mat. Med., vol. ii, pt. i, p. 433; Pharmacographia, p. 532; Garr. Mat. Med., p. 345; U. S. Disp. by W. & B., p. 803; Chevallier, Journ. de Pharm., vol. vi, p. 365; Wiegand, in Amer. Journ. Pharm., vol. x, 1845; Maisch, in Am. Journ. Pharm. (1874), p. 106; Proc. Amer. Pharm. Ass. (1873), p, 441; Millemann, in Amer. Journ. Pharm., 4th ser., vol. iv, p. 511, and Year Book of Pharmacy (1875), p. 210.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum, collected in Florida.

1. A complete plant.
2. Vertical section of a flower.
3. Flower with the perianth removed.
4. Transverse section of the ovary.
5. Fruit.
6, 7. Upper, and—8. Under surface of the seed.
9 and 10. Sections of the same.

(3, 4, 7, 8, 9, 10 enlarged.)

D Blair F.L.S. ad nat. del. et lith.

M & N Hanhart imp.

ORYZA SATIVA, *Linn.*

N. Ord. GRAMINEÆ. Lindl. Veg. K., p. 106; Le Maout & Dec., p. 880.

Tribe *Oryzeæ*.

Genus Oryza,* *Linn.* Steudel, Syn. Gram., p. 2. Species about 12, natives of the hotter parts of both hemispheres.

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291. Oryza sativa, *Linn., Sp. Plant., ed.* 1, p. 333 (1753).

Rice. Nivara, Dhan (India).

Syn.—O. montana, *Loureiro*, &c. O. setigera, *Beauv.* O. latifolia, *Desv.*

Figures.—Nees, t. 36; Berg, Charact., t. 6, fig. 67; Host, Gram. Austriac, iv, t. 25; Nees, Gen. Fl. Germ.; Fl. Brasil., fasc. 51, t. 1.

Description.—An annual; stems much branched below, cylindrical, jointed, hollow, smooth, slightly striated, pale green, 2—10 feet long, the lower part floating in water or prostrate, with roots at the nodes, the rest erect. Leaves alternate; sheaths 6—12 inches long, not inflated, smooth, the lowest ones without blades; ligule in the largest leaves an inch long, erect, lanceolate, very acute; blade linear, 1—2 feet long, the largest nearly 1 inch wide, tapering to a sharp apex, edges minutely serrate, with sharp forward-pointing prickles, surface rough above, nearly smooth beneath, bright pale green, midrib well defined. Spikelets one-flowered, stalked, articulated with the expanded summit of the short pedicel, erect, laxly arranged on one side of the branches of the narrow terminal fastigiate panicle, which is about 9—15 inches long, at first erect, afterwards drooping; rachis flexuose, slightly rough, angular, with small tufts of woolly hair at the base of the branches; glumes very small, nearly equal, lanceolate-subulate, membranous, smooth, 1-nerved; pales equal, about three times the length of the glumes, boat-shaped, somewhat laterally compressed, keeled and more or less hairy at the upper part on the back, coriaceous, pale green, persistent, the lower pale (" flowering glume " of some authors), 3-nerved, some-

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* *Oryza, ὄρυζα*, the classical name for the grain.

what gibbous above, either blunt or acute or terminating in a sharp, smooth, purple awn, which is short or many times longer than the spikelet, the upper pale without obvious nerves or 3-nerved; beneath the pales the rachis is expanded into a small knob or callus. Lodicules 2, collateral, thick, fleshy, semi-transparent, pointed. Stamens 6, hypogynous, anthers exserted, linear, versatile. Ovary smooth, tapering; styles 2, short, stigmas red, with rough spreading hairs on all sides (aspergilliform). Fruit (caryopsis) enclosed in the persistent pales, which, however, are not adherent to it, $\frac{1}{4}$—$\frac{3}{8}$ of an inch long, oblong-ovoid, blunt, smooth, somewhat compressed; pericarp very thin, adherent to testa; embryo at the base of the narrow diameter of the seed on the outside of the abundant horny endosperm.

Habitat.—The Rice is no doubt native in India, in all parts of which the wild form is common by the sides of tanks, ditches, and rivers. According to Bretschneider's researches it is also doubtless indigenous to China. In both these countries it has been cultivated very extensively from remote antiquity. It was very early introduced into East Africa and Syria, and at the present day it is also grown in immense quantities in all the subtropical and tropical parts of the globe, having been long ago introduced into America, where it has now the look of a native plant. In Europe, Rice was introduced into the Mediterranean basin from Syria by the Arabs in the middle ages; it is now grown largely only in the plain of Lombardy. In England it has been cultivated as a curiosity from the days of Gerard, and may be seen treated as a water plant in the hothouses of most botanic gardens.

As is to be expected in the case of a cereal so long and extensively cultivated, there is a very great number of varieties. Moon enumerates no less than 160 kinds distinguished by the Cinghalese, and Roxburgh gives some 40 or 50 cultivated in India, where, he states, the wild form, though its grain is collected for use, is never cultivated. Irrigation is necessary for most sorts, but some varieties require little water, or can be grown even on ordinary dry ground. The chief differences are found in the greater or less

length of the grain, from narrowly ovoid to nearly spherical, and in its colour, which may be quite white, or black, or red, or mottled with brown; the pales also vary in colour, in hairiness, and greatly in the length of the awn.

Roxburgh, Fl. Ind., ii, p. 206; Moon, Cat. Pl. Ceylon, p. 26; Roemer & Schultes, Syst. Veg., vii, p. 1363; Kunth, Enum. Plant., i, p. 7; Steudel, Synopsis Gram., p. 3; De Candolle, Géogr. Bot., p. 941; Bretschneider, on the Study of Chinese Botanical Works, pp. 8, 9.

Official Parts and Names.—1. ORYZA; the husked seeds: 2. ORYZÆ FARINA; the Flour procured from the seeds (I. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of the United States.

1. ORYZA. *Rice.*—Rice in the state in which it is official in the Pharmacopœia of India, and ordinarily seen in commerce, may be described as varying in length from about one tenth to a quarter of an inch, as translucent, white, oblong-cylindrical in form, furrowed, blunt at both extremities, brittle, without odour, and with a mild demulcent taste. The varieties of Rice are very numerous; those most esteemed in this country are Carolina and Patna. Rice as described above, is called *Bras* by the Malays; and when enclosed in the husk, in which state it is also found, it is termed *Paddy*.

2. ORYZÆ FARINA. *Rice Flour.*—This is the flour procured from the seeds; it is commonly known in commerce under the name of *ground rice*.

Rice has been repeatedly analysed; it contains essentially the same constituents as the other cereal grains, namely, *starch*, *gluten* and other *nitrogenous substances*, *fatty matters*, various *inorganic constituents*, &c. The proportion of starch in rice has been estimated as varying from about 85 to nearly 90 per cent. The granules of rice starch are remarkable as being amongst the smallest of all known starch granules, being frequently under $\frac{1}{5000}$ of an inch in length. The proportion of nitrogenous constituents is about 7 per cent.; and of fatty matters 0·80 per cent. From a comparison with other cereal grains rice contains a larger

proportion of starch, much less nitrogenous substanccs, and less of fatty matters and inorganic constituents.

Medical Properties and Uses.—Rice has demulcent and nutritive properties, like those of wheat, for which it is commonly substituted in tropical countries. Decoction of Rice, commonly called Rice-water, is recommended in the Pharmacopœia of India as an excellent demulcent refrigerant drink in febrile and inflammatory diseases, and in dysuria and other affections requiring this class of remedies. It is rendered more palatable by being acidulated with lime juice, and sweetened with sugar. This decoction may be also used as an enema in affections of the bowels. Dr. Waring speaks highly of a poultice of Rice as a substitute for that of linseed meal; and finely-powdered rice flour may be used like that of wheat flour, as a local soothing application to erysipelatous surfaces, burns, scalds, &c. Rice Starch is applicable in like cases to that of wheat and other starches, both medicinally and in other ways; it is largely consumed at the present time.

The chief consumption of rice is as a food substance, the grain being more largely used for this purpose than that of any other cereal; it is, however, less nutritive than wheat and the other cereal grains in ordinary use, from the fact already noticed, of its containing a much smaller proportion of nitrogenous substances than is found in them. Being entirely free, however, from laxative qualities, it forms a light, digestible, and useful article of food for those in which there is a tendency to diarrhœa. It has been observed, however, that when substituted for potatoes in our workhouses in consequence of the failure of that crop, it has after a few months produced scurvy. This effect has been ascribed by Garrod to the small proportion of potash which rice contains in comparison with potatoes. Rice also contains less vegetable acids than potatoes, which doubtless has something to do with the injurious result attributed to its use. The various other ill effects, such as disordered vision, cholera, &c., which have been ascribed to its use, rest on no reliable foundation.

A kind of spirit called Arrack is sometimes distilled from the

fermented infusion of rice, but that name is only properly used in reference to the spirit distilled from Palm Wine or Toddy.

Per. Mat. Med., vol. ii, part 1, p. 73; Pharmacopœia of India, p. 254; Waring's Man. Pract. Therap., p. 531; Bentley's Man. Bot., pp. 37 and 686; Garrod, in Monthly Journal of Medical Science, January, 1848; Boussingault, in Ann. Chem. et Phys., vol. lxvii, p. 413.

DESCRIPTION OF PLATE.

Drawn from a specimen grown in the Royal Gardens, Kew.

1. A panicle and the uppermost leaf.
2. A spikelet.
3. Glumes.
4. Pales.
5. Lodicules (erroneously represented as opposite).
6. A flower.
7. Anther.
8. Stigma.
9. Fruit enclosed in the pales.
11. Transverse section of the same.
10. The grain.
12. Section through base of the same, showing embryo.

(2—12 enlarged.)

DISCARD

D.Blair ad sicc del et lith.

M&N Hanhart imp.

ACACIA SENEGAL, *Willd.*

N. Ord. LEGUMINOSÆ, *Mimoseæ*.

Tribe *Acacieæ*.

Genus **Acacia**,* *Willdenow*. B. & H., Gen., i, p. 594; Baill., Hist. Pl. ii, p. 68. Schweinfurth, in Linnæa, xxv (1867), pp. 308—376. Over 430 species are known, found principally in Australia, but also in the hotter parts of America, Africa, and Asia.

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94. Acacia Senegal,† *Willd., Sp. Plant.*, iv, *p.* 1077 (1805).

Verek (Senegal). *Hashab* (E. Africa).

Syn.—Mimosa Senegal, *Linn.* M. senegalensis, *Lam.* Acacia Verek, *Guill. & Perr.* A. rupestris, *Stocks.*

Figures.—Guill. & Perr., Fl. Senegamb., i, t. 56; Schweinfurth, in Linnæa, xxv, t. 22 A (fruit); Reliquiæ Kotschyanæ, t. 3 (leaves and fruit).

Description.—A small tree, about 20 feet in height, with an erect trunk and irregular, tortuous, slender, terete branches, the young ones somewhat thickened at the nodes where are three strong hooked prickles, one beneath the petiole and two lateral (sometimes straight), infra-stipular in position, all dilated at the base, polished and black above; bark nearly smooth, brown, on the young branches pale greyish brown, or nearly white. Leaves alternate, often in axillary fascicles of two, rather small, 1—1½ inch long, shortly stalked, without apparent stipules, bipinnate, the rachis slender, finely tomentose, with a small gland at the apex and another near the base, primary divisions (pinnæ) opposite in 3 to 5 pairs about ½ inch long, leaflets opposite in 10 to 20 pairs, crowded, sessile, linear-oblong, obtuse or acute, rigid, easily disarticulating from the rachis, greyish green, about ⅛ inch long. Flowers sessile, small, laxly arranged in slender, cylindrical, erect, stalked spikes 2—3 inches long, from the axils of the leaves, and much exceeding them. Calyx campanulate, cut

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* *Acacia, ἀκακία*, was the name given to a thorny Egyptian shrub by Dioscorides.

† *Senegal*, the name of the country where the plant was first found.

about half way down into 5 narrow-triangular acute segments, downy. Corolla usually gamopetalous, campanulate, about twice the length of the calyx, divided nearly half way down into 5 acute segments, white. Stamens very numerous, filaments slender, erect, about 3 times the length of the corolla, yellowish, united at the very base into a very short perigynous tube inserted on the base of the corolla, anthers very small, roundish. Ovary shortly stalked, very small, oblong, style terminal, filiform, shorter than the stamens, stigma terminal. Pod shortly stalked, 3 or 4 inches long by about ¾ wide, more or less constricted between the 2—6 seeds, flat except over the seeds, smooth, pale, membranous, with a strong fibrous marginal rib and fainter transverse reticulating veins. Seeds with a long funicle slightly dilated at the hilum, roundish in outline, very much compressed, marked on the centre with a concave arched line, brown, embryo with large circular plane-convex cotyledons and a small, blunt, slightly exserted radicle, no endosperm.

Habitat.—This species of *Acacia*, as indicated by its name, is a native of Senegal in West Tropical Africa, where it covers extensive tracts of sandy ground; it is also found abundantly on the other side of the continent in the countries bordering the Upper Nile, Southern Nubia, Atbara, and especially Kordofan, all in the tropics. The same species appears to occur in Scinde; whether it grows also in Arabia is not known.

From the explorations of the African traveller, Schweinfurth, there is no doubt that it is from this species that the best "gum arabic" is obtained in Nile-land. The gum exudes spontaneously from the branches and is readily detached; it is brought down the river into Egypt, from which country it is exported.

In Senegal, also, the gum of this plant has long been collected, but Adanson in 1788 was the first to properly describe the tree from which it is obtained. At the present time it is collected exclusively by the Moors in woods mainly composed of the tree on the right bank of the river Senegal, opposite the French ports of Dagana, Podor, Matam, &c. It is found to exude principally

during the prevalence of the dry desert winds from the north and east which blow in the winter after the rainy season. M. C. Martins has observed that the gum is excreted mostly at the bifurcation of the branches, but that its production is especially stimulated by the growth of a species of the parasitic genus *Loranthus*, which he has described as *Loranthus senegalensis*. This forms a large swollen base where it is inserted on the *Acacia*-branch, and around this the excretion of gum is very abundant.

The following African species of *Acacia* also afford inferior gum. They all differ from the above in having the flowers arranged in globose capitula.

Acacia tortilis, Hayne. Hayne, x, t. 31; Nees, t. 335.
A. arabica, Willd. (A. nilotica, *Desf.* A. vera, *Willd.*). Roxb., Pl. Coromand., ii, t. 149, cop. in Hayne, x, t. 32; Nees, t. 333. Cultivated also in India.
A. horrida, Willd. (A. capensis, *Burch.* A. Karroo, *Hayne*). Hayne, x, t. 33.
A. gummifera, Willd. Hayne, x, t. 28.
A. Seyal, Del. (A. Fistula, *Schweinf.*). Hayne, x, t. 30; Nees, t. 336; Schweinf., l. c., tt. 11–14; Berg & Sch., t. 6 d.
A. Ehrenbergiana, Hayne. Hayne, x, t. 29; Nees, t. 334.
A. stenocarpa, Hochst. Schweinf., l. c., tt. 17, 18.

Lamarck, Dict., i, p. 19; Guill. & Perrottet, Fl. Seneg. Tent., i, p. 245; Schweinfurth, in Linnæa, xxxv (1867), p. 374, and Reliquiæ Kotschyanæ, p. 3; Oliver, Fl. Trop. Africa, ii, p. 342; Benth., in Trans. Linn. Soc., xxx, p. 516; Flück. & Hanb., Pharmacogr., p. 206; C. Martins, in Bull. Bot. Soc. France, 1875, p. 20.

Official Part and Names.—Acaciæ Gummi; a gummy exudation from the stems of one or more undetermined species of Acacia, *Linn.* (B. P.). The gummy exudation from the stem of Acacia vera, *Willd.*, and other undetermined species of Acacia yielding Gum Arabic (I. P.). Acacia; a gummy exudation from Acacia vera and other species of Acacia (U. S. P.).

Production, Collection, and Commerce.—Acacia gum is not a *degradation-product* like that of Tragacanth gum, which owes its formation to the more or less complete transformation of the

cells of the pith and medullary rays of species of *Astragalus;* but it is a natural liquid product which at certain seasons is formed in such large quantities that it bursts through the tissues of the stem and branches, and subsequently hardens by exposure to the air. As a general rule, therefore, gum acacia exudes spontaneously, and so freely, that wounding the bark is unnecessary; but in some districts the outflow is facilitated by incisions. In Kordofan the gum is collected by breaking the lumps off the trees with an axe, and then placing them in baskets for convenience of transport. The best gum comes from Kordofan; it is known as *Hashabi* gum. It is said that 30,000 cwt. are collected annually in this district. In Senegal the gum begins to exude after the rainy season in November, at which period the dry winds from the desert set in and cause the bark to crack, when the juice flows out and hardens in large masses. The collection then commences and is continued more or less till the end of July. This gum is mostly shipped to Bordeaux, where in some years over 100,000 cwt. are imported. By far the greater proportion of the gum imported into this country arrives from Egypt, but the total amount is liable to great variation; thus, while according to Flückiger and Hanbury, we imported 76,136 cwt. in 1871, in 1872 our total importation was only 42,837 cwt.

Varieties and General Characters.—According to Flückiger and Hanbury the principal varieties of Acacia gum which are known in the London market are as follows: — 1. Kordofan Gum, Picked Turkey Gum, or White Sennaar Gum; 2. Senegal Gum; 3. Suakin Gum, Talca or Talha Gum; 4. Morocco, Mogador, or Brown Barbary Gum; 5. Cape Gum; 6. East India Gum; and 7. Australian or Wattle Gum.

1. *Kordofan, Picked Turkey,* or *White Sennaar Gum.*—The botanical source of this gum, according to the most reliable information, is *Acacia Senegal,* the plant now under description. It is termed in Egypt *Hashabi gum.* The common name of *Gum Arabic* which is applied to this and other kinds of gum derived from the species of Acacia is a misnomer, as very little

gum is collected in, and none appears to be exported from, Arabia.

This gum, which is the best of all the kinds and the only one that should be used for medicinal purposes, either occurs in spherical or ovoid tears or masses, which vary in size from that of a pea to a walnut; or in fragments of tears. When entire the tears are usually rounded on their surface, and more or less opaque in appearance from the presence of numerous cracks extending into their substance; but when in fragments, the pieces are angular, and have a glistening character. The presence of these cracks makes the gum very brittle, so that it is readily broken into small fragments; the fractured surfaces presenting a vitreous appearance. The finest pieces are colourless or nearly so, and without odour, but with a bland mucilaginous taste. When of inferior quality this gum has a brownish, yellowish-brown, or reddish-brown colour.

2. *Senegal Gum.*—This kind of gum, like that of Kordofan gum, is the produce of *Acacia Senegal.* But little of it comes to England, although, as already stated, it is largely imported into France from Senegal. It usually occurs in larger pieces than those of Turkey gum, being sometimes as large as a hen's egg or even a man's fist; and although we occasionally find pieces of a whitish colour, they are for the most part yellow, reddish-yellow, or brownish-red. The masses are also less brittle than the pieces of Kordofan gum, as the numerous cracks seen in the latter are nearly absent in Senegal gum; their fracture is also more conchoidal, and we frequently find large air cavities in their centre.

3. *Suakin Gum, Talca* or *Talha Gum.*—This gum, according to Flückiger and Hanbury, is yielded by *Acacia stenocarpa*, Hochst, and *A. Seyal*, Delile, var. *Fistula.* It is a very brittle gum, and hence although entire pieces are sometimes to be met with which are permeated in all directions by minute cracks, it is commonly seen in the market broken up into small fragments of a whitish, brownish, or reddish-brown colour. It is a very inferior variety of gum.

4. *Morocco, Mogador,* or *Brown Barbary Gum.*—The botanical source of this gum is supposed to be *Acacia arabica,* Willd. It is usually of a brownish colour, and is found either in small, angular, mostly broken pieces; or in tears, which when perfectly dry are permeated by cracks like Turkey gum, and very brittle.

5. *Cape Gum.*—This is principally derived from *Acacia horrida,* Willd. It is in small fragments of an amber-brown colour, and is regarded as a very inferior kind of gum.

6. *East India Gum.*—This gum is the produce of *Acacia arabica,* Willd., and other species of *Acacia.* It is principally imported from Bombay, hence its name; but it is almost entirely the produce of Eastern Africa. It varies very much in its appearance, and is commonly mixed with other gums; it is regarded as a very inferior kind.

7. *Australian* or *Wattle Gum.*—This is the produce of various species of *Acacia,* thus, according to Flückiger and Hanbury, of *A. pycnantha,* Benth.; *A. decurrens,* Willd.; *A. dealbata,* Link.; and *A. homalophylla,* A. Cunn. It is found commonly in large tears or masses, of a dark yellow or reddish-brown colour. This gum, which has a transparent appearance, being nearly free from cracks or fissures, is said to be readily soluble in water, and to form a very adhesive mucilage. It is frequently contaminated with pieces of the astringent barks of the trees from which it is obtained; hence its solution unless carefully prepared, will frequently contain some tannic acid.

It will be seen from the above general notice of the varieties of gum that they vary much in their characters, and that the Kordofan or Turkey Gum is the finest kind. The characters and tests of good gum are given in the British Pharmacopœia as follows:—"In spheroidal tears usually from half an inch to an inch in length, nearly colourless, and opaque from numerous minute cracks, or in fragments with shining surfaces; brittle; bland and mucilaginous in taste; insoluble in alcohol, but soluble in water. The aqueous solution forms with subacetate of lead an opaque white jelly. If an aqueous solution of iodine be added to

the powder, or to a solution formed with boiling water and cooled, there is no appearance of a violet or blue colour."

Composition.—Gum acacia consists essentially of an acid called *arabic acid, gummic acid,* or *arabin,* in combination with lime, magnesia, and potash. This salt or mixture of salts forms about 70 per cent. of the gum; the remainder consists of water, and of various saline and earthy matters. Gum acacia is soluble in both hot and cold water, and its solution has an acid reaction. Sub-acetate of lead, as already noticed, forms an opaque white jelly when added to the solution; but no precipitate is formed in a solution of gum acacia by the neutral acetate of lead, in which respect it differs from a solution of gum tragacanth, which yields an abundant precipitate under the same circumstances. By the action of nitric acid acacia gum is resolved into mucic acid and a little oxalic acid; and when boiled with diluted sulphuric acid it is slowly converted into grape sugar.

Medical Properties and Uses.—Gum acacia possesses demulcent and emollient properties, for which purposes it is sometimes employed medicinally; but it is chiefly used as a vehicle for the exhibition of other medicines, thus, to suspend insoluble powders, and in the formation of lozenges. In coughs gum often affords much relief, when it is allowed to dissolve slowly in the mouth; and under the same circumstances it is frequently useful in allaying irritation of the throat and air passages, by diluting the acid secretions and sheathing the parts from the action of the air. It is also used internally in inflammatory affections of the stomach and bowels; and its influence as a demulcent is supposed to extend even to the urinary organs, and thus to be useful in irritation of the bladder and urethra. But in the latter cases it is probable that its beneficial effects are in a great measure due to the quantity of fluid which is taken with it, diluting and thus diminishing the irritating action of the urine. Gum has also been recommended as a substitute for amylaceous food in diabetes, as it is not converted into sugar; but its use in this disease does not appear to have been attended with any appreciable benefit.

A thick mucilage of gum has also been recommended as an

application to burns and scalds, and to sore nipples, &c. The local application of powdered gum has likewise been found useful in checking hæmorrhage from leech-bites; and when blown up the nostril it has arrested severe epistaxis.

Gum also appears to possess some nutritive properties, as it forms almost exclusively the food of those engaged during the period of its collection, &c.; and also in times of scarcity of the Hottentots.

Gum is also largely used for other purposes than in medicine. Thus large quantities are employed in the arts for giving lustre to crape and silk; for thickening colours and mordants in calico printing, &c.; for suspending the tannate of iron in the manufacture of ink and blacking; and for other purposes. The bark and unripe fruits of several species of Acacia are also used for tanning and dyeing.

Steph. & Church., Med. Bot., by Burnett, vol. ii, pl. 77; Per. Mat. Med., vol. ii, pt. 2, p. 332; Per. Mat. Med., by B. & R., p. 848; Pharmacographia, p. 206; U. S. Disp., by W. & B., p. 6; Garr., Mat. Med., p. 247; Watts' Dict. Chem., vol. ii, p. 953; Schweinfurth, in Linnæa (1867), p. 308; Brandis, Forest Flora of North-Western and Central India, p. 181; Vaughan, in Pharm. Journ., vol. xii, 1st ser., p. 226; Fremy, in Ph. Jl., vol. i, 2nd ser., p. 518.

DESCRIPTION OF PLATE.

Drawn from a specimen collected in Senegal by Perrottet, in the British Museum; the fruit added from Schweinfurth.

1. A branch with flowers.
2. A flower.
3. Section of flower.
4. A pod.
5. The same, opened.
6, 7. Seeds.

(2 and 3 enlarged.)

阿楷西耶加的主 出兒茶

D.Blair ad. sicc. del. et lith.

M&N.Hanhart imp.

ACACIA CATECHU, *Willd.*

N. Ord. LEGUMINOSÆ, *Mimoseæ*.

Tribe *Acacieæ*.

Genus **Acacia**, *Willd.*

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95. Acacia Catechu,* *Willd., Sp. Plant.*, iv, *p.* 1079 (1805).

Khair, Kher (India).

Syn.—Mimosa Catechu, *Linn. f.* M. Sundra *and* M. catechuoides, *Roxb.* Acacia Chundra, *Willd.* A. Sundra, *Spreng.* A. Sandra, *Beddome.* A. catechuoides, *Benth.*

Figures.—Woodville, t. 157 (poor); Steph. & Ch., t. 76; Nees, t. 337; Berg & Sch., t. 6 e; Roxburgh, Pl. Coromandel, ii, t. 175, and (*A. Sundra*) ii, t. 225; Beddome, Fl. Sylvatica, t. 50 (*A. Sandra*).

Description.—A moderate-sized tree, not reaching more than 30 to 40 feet high and often smaller, with a short, somewhat crooked trunk, and numerous irregular straggling branches; bark brown or dark grey, rough, red and fibrous within; young branches smooth or pubescent, with a pair of sharp, hooked, brown prickles, just below the position of the stipules of each leaf. Leaves numerous, alternate, stalked; petiole with a prominent gland on the upper surface about the middle, and often armed with a few prickles, bipinnate, 5—8 inches long; pinnæ in 10—20 pairs, 1—2 inches long, narrow; leaflets opposite, 20—30 pairs in each pinna, sessile, overlapping, linear, blunt, $\frac{1}{8}$—$\frac{1}{4}$ inch long, glabrous or pubescent, entire. Inflorescence much as in *A. Senegal*, but the spikes often in pairs from the axils and the flowers a little larger, and pale yellow. Calyx glabrous or downy; corolla-segments rather broader; stamens about twice as long as corolla, the filaments not combined into a tube at the base; a small disk surrounds the stalk of the ovary; otherwise all as in *A. Senegal*. Pod 2—5 inches long by about $\frac{3}{4}$ inch broad, acute, containing 3—10 seeds, brown and shining, much flattened, smooth, coriaceous, with faint transverse anastomosing veins. Seeds as in the last species.

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* *Catechu* and *Kát* are Indian names for the extract, Kutch.

Habitat.—This is a common tree in most parts of India and Burmah, ascending to 3000 feet in the Himalaya valleys, generally growing gregariously. It is also found in Ceylon, but is probably not known out of Asia. It flowers in May and June. There are two forms in India, the glabrous (*A. Sundra*) and the pubescent (*A. catechuoides*); they are otherwise quite similar. The prickles are sometimes developed into hooked thorns of considerable length.

Catechu is also manufactured from *A. Suma*, Kurz, a very closely allied species, differing only in its white bark, more numerous leaflets, and shorter corolla. This is the *A. Catechu* of most authors, including formerly Bentham, whose more recent views are here followed. It is figured under that name in Beddome's 'Fl. Sylvatica,' t. 49, and as *A. campylacantha*, Hochst., by Schweinfurth in 'Plantæ Niloticæ,' t. 1. It is the commonest species in Southern India, but is scarcely known in the north of that country. It is this tree, and not the true *A. Catechu*, which is so widely spread in the forests of Eastern Tropical Africa, Sennaar, Abyssinia, Zambesi land, and Mozambique. No extract is, however, prepared from it on that continent. It has been also planted in S. America. The spines are sometimes very strong in this species.

Roxb., Fl. Ind., ii, pp. 562-3; Brandis, Forest Flora, p. 186; Oliver, Fl. Trop. Africa, ii, p. 344; Benth., in Trans. Linn. Soc., xxx, p. 519; Lindl., Fl. Med., p. 268; Flück. & Hanb., Pharmacogr., p. 213.

Official Part and Names.—Catechu Nigrum; an extract of the heart-wood (I. P.). Catechu; an extract prepared principally from the wood of Acacia Catechu (U. S. P.). It is not now official in our Pharmacopœia: but it was recognised in the first edition of the British Pharmacopœia published in 1864; and was formerly official in the London, Edinburgh, and Dublin Pharmacopœias.

Kinds of Catechu—We have noticed under the head of *Uncaria Gambier* the more important kinds of catechu which are known in

commerce, and described in detail the official *Catechu Pallidum* of the British Pharmacopœia and the Pharmacopœia of India. The official botanical source of the Catechu now to be described is *Acacia Catechu*, Willd., but it is also in part derived from *Acacia Suma*, Kurz.

Preparation.—The preparation of catechu varies somewhat in different localities; but as a general rule it may be thus described:—The trees are regarded as suitable for the process when about one foot in diameter, at which period they are therefore cut down, and then the inner dark-coloured wood is either alone cut into small chips, or, according to other accounts, the whole of the wood except that of the smaller branches, after being stripped of the bark, is thus treated. The chips are then put into small earthen pots or jars, which are arranged over a fireplace built of mud placed usually in the open air; and the whole covered with water. The water is then made to boil, and after a considerable portion has evaporated, the liquor is strained or simply decanted into another vessel, and the evaporation continued until the extract is of sufficient consistence, when it is poured into moulds made of clay, or of leaves pinned together; or simply upon a mat or cloth which has previously been covered with the ashes of cow-dung, and divided while yet soft into more or less square pieces by means of string. The drying is then completed in all cases by subsequent exposure of the extract to sun and air. In this way is prepared the ordinary dark-coloured varieties of catechu which are commonly found in Europe and America; but at Kumaon, in the north of India, by a modification of this process, the drug is obtained of a pale ashy-white or pinkish-brown colour. It is said that the essential difference in the preparation of this kind of catechu consists in stopping the evaporation before the decoction has arrived at the condition of an extract, and allowing the liquor to cool on twigs and leaves placed in the pots for that purpose.

Commerce.—A very large proportion of the Catechu now imported from British India into this country and the United States of America is the produce of Bengal and Burma. The

average total imports from British India into the United Kingdom for the years 1871, 1872, 1873, and 1874, was about 5000 tons, and the value in each year about £120,000. The best catechu comes from Pegu. It is imported into the United States either directly from British India, and chiefly from Calcutta, or indirectly from Great Britain. It is packed in mats, bags, or boxes.

General Description and Composition.—This kind of catechu, which is commonly known under the name of *Kutch* or *Cutch*, is generally distinguished from the official *Catechu pallidum* by its blackish colour; hence the name of *Catechu nigrum* by which it is also known. Several varieties of this catechu have been distinguished by pharmacologists from their varying forms and colours, &c., but it is generally found in large masses each of which weighs several pounds, and even in some cases as much as a hundredweight; these masses are made up of layers composed of more or less oblong pieces of catechu, which vary in length from six to ten inches, in breadth and depth from one to two inches or more, and each piece commonly enveloped in the large rough leaf of *Dipterocarpus tuberculatus*, Roxb. Cutch has a dark rusty-brown or blackish-brown colour externally; it is hard and brittle, and when broken, it presents a more or less shining bubbly surface of a blackish-brown colour or various shades of reddish brown. It dissolves slowly in the mouth, and has a very astringent and slightly bitter taste, succeeded by a sensation of sweetness; it has no odour. When recently imported it is sometimes soft and tenacious internally, and if it be then pulled out into a thin film it commonly presents a translucent granular appearance, and a bright orange-brown colour; or if examined under the microscope after being further softened in water, it exhibits in the same manner as gambier or pale catechu an abundance of very small acicular crystals of *Catechin* or *Catechuic acid.*

The ordinary cutch of commerce is essentially composed of *catechin* or *catechuic acid*, and *catechu-tannic* or *mimotannic acid;* but the pale-coloured cutch described above as being prepared at Kumaon, in Northern India, is almost entirely composed of the former. These two constituents may be readily distinguished by immers-

ing cutch in cold water, when the catechu-tannic acid is dissolved, forming a deep brown-coloured solution; and the catechin which is nearly insoluble in cold water is left behind as a mass of minute acicular colourless crystals. Catechin is, however, soluble in boiling water, and also in alcohol, and ether. Catechu-tannic acid is distinguished from gallo-tannic acid by its solution yielding a greenish precipitate with the persalts of iron; and by not causing a precipitate in a solution of emetic tartar. A minute quantity of *quercetin*, a yellow crystalline substance, may be extracted from a cold aqueous solution of cutch by means of ether, as first ascertained by Löwe.

Medical Properties and Uses.—The properties and uses of this kind of catechu are the same as those of pale catechu; they are described under *Uncaria Gambier*.

Per. Mat. Med., vol. ii, pt. 2, p. 340; Pharmacographia, p. 213; U. S. Disp., by W. & B., p. 240; Royle's Illustrations, p. 182; Woodville's Med. Bot., vol. ii, pl. 66, p. 183; Steph. & Church., Med. Bot., by Burnett, vol. ii, pl. 76; Madden, in Journ. Asiat. Soc. of Bengal, vol. xvii, pt. 1 (1848), p. 565; Watts' Dict. Chem., vol. i, p. 816; Gmelin's Chem., vol. xv (1862), p. 515; Fresenius, Zeitschrift für Anal. Chemie (1873), p. 127.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum, collected in India by Dr. Roxburgh.

1. A branch with flowers.
2. A flower.
3. Section of a flower.
4. A pod.
5. A seed.

(2, 3 enlarged.)

D.Blair, F.L.S. ad nat. del. et lith.

M & N Hanhart imp

N. Ord. THYMELACEÆ.
Genus Daphne, *Linn.*

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226. Daphne Laureola,* *Linn., Sp. Plant. ed.* 1, p. 357 (1753).

Spurge Laurel.

Figures.—Hayne, iii, t. 44; Nees, t. 126; Syme, E. Bot., viii, t. 1247 Hook. Curt. Fl. Lond., v, t. 206; Reich., Ic. Fl. Germ., xi, t. 555.

Description.—A small bushy shrub, 1—3 feet high, with ascending, slender, flexible branches; bark smooth, tough, yellowish grey; terminal buds large, quite glabrous. Leaves evergreen, alternate, rather closely placed towards the ends of the branches which are bare below, somewhat drooping, scarcely stalked, 3—5 inches long, narrowly obovate-lanceolate, bluntly pointed, attenuated below, entire, thick and leathery, perfectly smooth, bright green, paler and with a very prominent midrib beneath. Flowers very shortly stalked, 3—8 together, forming small umbellate clusters at the extremities of short, somewhat drooping peduncles, provided with several broad, blunt, overlapping, pale-green, concave bracts, and coming from the axils of the upper leaves of the previous year. Perianth not ½ inch long, about ¼ inch wide, pale yellowish green, the segments not half as long as the tube, smooth, otherwise as in *D. Mezereum.* Stamens and pistil as in the last, but style somewhat longer; anthers orange. Fruit about ½ inch long, ovoid, scarcely pointed, shortly stalked, nearly black, structure as in *D. Mezereum.*

Habitat.—This attractive little shrub is a native of England, occurring not unfrequently on hedgebanks and in woods and copses chiefly on a calcareous or clay soil in most of the counties south of Durham; in Scotland it is not considered to be spontaneous. It is very frequently planted in shrubberies for ornament, being one of the few shrubs which will grow under the drip of large trees. Abroad it is found throughout Western and Southern Europe,

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* *Laureola*, a mediæval name signifying a small laurel; from its foliage.

but does not reach N. Germany or Russia; it also occurs in the Azores, Algeria, and Asia Minor.

The peculiar green flowers appear in the winter and early spring from January to April, and have a pleasant scent; they are often polygamous, some male flowers being intermixed with the ordinary bisexual ones; the male flowers have the perianth-tube longer. The fruits are ripe in summer, by which time, in consequence of the growth of the shoot, they are some way down the stem.

Hook. f., Stud. Fl., p. 622; Syme, E. Bot., viii, p. 86; Watson, Comp. Cyb. Br., p. 304; Meisner, in DC. Prod., xiv, p. 539; Gren. & Godr., Fl. France, iii, p. 57; Lindl., Fl. Med., p. 324.

Official Part and Names.—MEZEREI CORTEX; the dried bark of Daphne Mezereum, *Linn.*, or of Daphne Laureola, *Linn.* (B. P.). The dried bark of the above plants (I. P.). It is not official in the Pharmacopœia of the United States, the bark of Daphne Gnidium being there substituted for it.

We have already noticed this bark in our article on "Daphne Mezereum," and also referred to the generally received opinion in regard to the comparative activity of the root-bark and stem-bark of that species. The same remarks also apply in this particular to the present species; but the bark generally of *Daphne Laureola* is commonly regarded as somewhat less acrid than that of *D. Mezereum*. Squire says that the "latter has decidedly the advantage, both in the degree and duration of the irritation produced on the mucous linings of the throat." The difficulty, however, of obtaining a sufficient supply of the true Mezereon bark led to that of *Daphne Laureola* being also made official in the British Pharmacopœia and the Pharmacopœia of India.

Collection, General Characters, and Composition.—This bark, which is commonly known as *Spurge Laurel* or *Wood Laurel bark*, should be collected for medicinal use between November and February. The stem-bark is that most commonly met with in commerce. It is either collected in this country, or imported from the Continent, and more especially from Germany; but at the present time nearly all the Mezereon bark in use in the

United Kingdom is derived from *Daphne Mezereum*. The bark of the Spurge Laurel corresponds essentially in its characters with that of the true mezereon plant already described; but the bark of the younger branches of its stem may be distinguished from that of the latter species by the absence of the leaf-scars which are so evident in it. The bark of *D. Laureola* has the same taste and odour as that of *D. Mezereum*, but, as already noticed, it is generally regarded as somewhat less acrid in taste, although its odour is said by Squire to be more marked than in it, especially when recently dried. Squire also states in reference to these two barks that "the inner bark of *Daphne Mezereum* is highly acrid, creating in the mouth and fauces a burning sensation, and, if swallowed, it affects the whole lining of the œsophagus and stomach in the same manner. With some individuals this sensation continues only a few hours, while others feel it as long as two days. In the case of *D. Laureola*, I remarked that this effect is followed by a profuse perspiration of the face, head, and neck, and that as soon as this was fairly produced, the heat in the œsophagus and stomach began to subside."

The chemical composition of this bark is doubtless analogous to that of the true Mezereon bark; this has been described under the head of *Daphne Mezereum*.

Medical Properties and Uses.—Similar to those of the bark of *Daphne Mezereum*, under which they are noticed. The leaves were formerly employed as an emmenagogue, but unless very carefully used they produce violent vomiting and purging. They, as well as the bark, have been employed to cause abortion.

Per. Mat. Med., vol. ii, pt. 1, p. 481; Pharmacographia, p. 487; Gerarde's Herball, by Johnson (1636), p. 1405; Miller's Gard. Dict., vol. i, pt. 2; Watts' Dict. Chem., vol. ii, p. 304; Squire, in Pharm. Jl., vol. i, ser. 1st, p. 397.

DESCRIPTION OF PLATE.

Drawn from a specimen collected in the Isle of Wight by Mr. Stratton; the fruit added from Nees. 1. Upper part of a branch with flowers. 2. Vertical section of flower. 3. Perianth laid open. 4. Vertical section of ovary. 5. Group of fruit. (2–4 enlarged.)

DISCARD

L.Blair F.L.S. ad nat. del. et lith.

M&N.Hanhart imp.

DAPHNE GNIDIUM, *Linn.*

N. Ord. THYMELACEÆ.

Genus Daphne, *Linn.*

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227. Daphne Gnidium,* *Linn., Sp. Plant., ed.* 1, *p.* 357 (1753).

Spurge Flax.

Syn.—D. paniculata, *Lam.*

Figures.—Hayne, iii, t. 45; Flora Græca, t. 356; Reichenb., Ic. Fl. Germ., xi, t. 553.

Description.—A small bush, about 2—5 feet high, with many slender, ascending, cylindrical branches; bark brownish or purplish grey, marked with small pale leaf-scars, slightly wrinkled. Leaves very numerous, alternate, crowded in the upper parts of the branches where they form a dense tuft, overlapping, ascending, persistent, sessile, 1—1½ inch long, linear- or narrowly oblong-lanceolate, gradually tapering at the base, rather suddenly narrowed into the sharp acuminate apex, entire, quite glabrous, thick, midrib prominent beneath. Flowers small, on short pedicels with which they articulate, arranged on the somewhat divaricate lax branches of several small panicles which terminate the stem and arise from the axils of the uppermost leaves which they considerably exceed in length; the whole forming a somewhat loose corymbose terminal inflorescence, branches covered with white down or silk, no bracts. Perianth about ⅛ inch long, densely downy outside, white, the divisions short; the rest as in *D. Laureola.* Fruit small, about ⅛ inch long, ovoid, slightly tapering, scarlet; structure that of the genus.

Habitat.—This species of Daphne is a frequent plant in the south of France, Spain, Portugal, and the western Mediterranean coasts and island, extending also to the Canaries and Madeira; eastward it reaches Greece, but is not found in Asia Minor. It grows in dry sunny situations, heaths and pine woods, producing its small scented flowers from July to September, being thus very

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* *Gnidium,* κνίδιος, native to Cnidos; a name given by Dioscorides to a small shrub, possibly the present one.

different in this respect to the early-flowering British species already described; the leaves are scarcely evergreen, but persist for some time on the plant.

It is occasionally cultivated in botanic gardens here, and appears to have been grown by Gerard in 1597 (see his Herball, p. 1217).

Meisner, in DC. Prod., xiv, p. 538; Gren. & Godr., Fl. France, iii, p. 60; Willk. & Lange, Prod. Fl. Hisp., i, p. 298.

Official Part and Name.—MEZEREUM; the bark of Daphne Mezereum, and of Daphne Gnidium (U. S. P.). It is not official in the British Pharmacopœia, or the Pharmacopœia of India, the bark of D. Laureola being in these volumes substituted for it.

In France the bark of *D. Gnidium* is also official, and under the name of *Ecorce de Garou* is used indiscriminately with that of *D. Mezereum*. The barks of *D. alpina*, of *D. Cneorum*, and of *D. Laureola* are also employed in France and Germany for the same purposes as those barks.

Collection, General Characters, and Composition.—The bark should be collected in the winter months, as already noticed with that of *D. Mezereum* and *D. Laureola*. The same remarks also apply in this plant as with them in reference to the comparative activity of the stem-bark and root-bark; the former is, however, that which is commonly in use. Squire, speaking generally of the species of Daphne, says, "the bark of the root is the most efficacious part of this class of plants; next in order the bark of the stems, the leaves, the woody parts of the stems and roots, and, lastly, the flowers."

In its general characters this kind of mezereon bark closely resembles the barks of *D. Mezereum* and *D. Laureola* already described under these respective heads; but it is commonly of a somewhat darker colour, and that of the younger stems and branches is marked with numerous, closely set, somewhat spirally arranged, whitish, leaf-scars. When the leaves are present, which is sometimes the case in the bark of commerce, the drug is readily distinguished, as these are very different in shape to those

of the other two species, being very narrow like those of the Flax plant; hence the common name of Spurge Flax which is applied to this species of Daphne.

Medical Properties and Uses.—Similar to those of *Daphne Mezereum* and *D. Laureola;* they are described under the former plant.

Gerarde's Herball, by Johnson (1636), p. 1403; Thomson's Lond. Disp., by Garrod (1852), p. 328; Christison's Disp., 2nd edit., p. 637; Pharmacographia, p. 487; Squire, in Pharm. Journ., ser. 1, vol. i, p. 395; U. S. Disp., by W. & B., p. 560.

DESCRIPTION OF PLATE.

Drawn from a specimen in the British Museum collected in the south of France.

1. A branch with flowers and fruit.
2. A flower.
3. Section of the same.
4, 5. Fruit.
6. A seed.
7. Section of the same.

(2, 3, 5–7 enlarged.)

D.Blair.FLS ad nat del et lith

M & N Hanhart imp

QUERCUS ROBUR. *Linn.*

N. Ord. CUPULIFERÆ. Lindl., Veg. K., p. 290; Le Maout & Dec., p. 714; Baill., Hist. Pl., vi.

Tribe *Quercineæ*.

Genus Quercus,* *Linn.* Baill., Hist. Pl., vi, p. 256. Species 300, natives of both hemispheres, chiefly in temperate regions.

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248. Quercus Robur,† *Linn., Sp. Plant., ed.* 1, *p.* 996 (1753).

Common Oak.

Syn.—Q. pedunculata, *Ehrh.* Q. sessiliflora, *Salisb.* Q. intermedia, *Don.* Q. pubescens, *Willd.*

Figures.—Woodville, t. 10; Hayne, vi, t. 36; Steph. & Ch., t. 151; Nees, tt. 92, 93; Berg & Sch., tt. 7 f, 8 a; Syme, E. Bot., viii, tt. 1288, 1289; Reichenb., Ic. Fl. Germ., xii, tt. 644, 648; Nees, Gen. Fl. Germ.

Description.—A tree often reaching the height of 80 or 100 feet, with a massive trunk and thick, wide-spreading, much-divided twisted branches; bark grey, deeply furrowed. Leaves numerous, alternate, spreading, nearly sessile or shortly stalked, with a pair of rather large, strap-shaped, blunt, chaffy, pale brown stipules at the base which are quickly deciduous, blade 2½—5 inches long, oblong-obovate, blunt at the apex, usually rounded at the narrow, often unsymmetrical base, irregularly sinuate with unequal, obtuse, rounded lobes, 4—6 on each side, which do not reach half way to the midrib, rather stiff, shining, quite glabrous and dark green above, paler and (when young) usually somewhat downy with stellate hairs beneath, plicately folded in the bud. Flowers inconspicuous, unisexual, monœcious; the male numerous, sessile, loosely and irregularly arranged on the hairy axis of very slender, pendulous catkins which are 1—3 inches long, without bracts, and come off generally 2 or 3 together from small scaly buds in the axils of the lowest leaves, or on the wood of the previous year. Female flowers sessile, surrounded by an involucre of several rows of triangular, acute,

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* *Quercus*, the Latin name for some species of oak.

† *Robur*, also a classical name for the oak, but applied especially to its hard timber.

strongly imbricated, ciliate reddish bracts forming a bud-like cup, solitary, or two or three at the extremity of erect tapering peduncles coming from the axils of the uppermost leaves and either very short (so that the flowers themselves seem axillary), or more usually nearly half an inch long, each flower subtended by a deciduous, acute, ciliate bract about its own length. Male flowers:—perianth cup-shaped, very deeply cut into 6—8 strap-shaped segments with laciniate ends; stamens 6—8, inserted on the central receptacle, filaments short, slender, anthers 2-celled, cells rounded, connate, dehiscing longitudinally, lemon yellow, becoming brown. Female flowers:—perianth completely fused with the ovary, the limb very small, usually with 6 teeth; ovary inferior, thick and fleshy, 3-celled, with 2 erect ovules in each cell; style thick, short; stigma rather fleshy, with 3 spreading lobes. Fruit (glans) surrounded at the base by the enlarged involucre which has become a solid hemispherical cup (cupule), extending about $\frac{1}{4}$ the length of the fruit, with an entire margin and several series of strongly appressed, bluntly triangular scales on its outer surface, solitary or two or three in a cluster, sessile or on an axillary stalk which may reach 3 or 4 inches in length, about 1 inch long, oblong-ovoid, tipped by the remains of the perianth-limb and style, readily separating from the cupule when ripe, 1-celled; pericarp coriaceous, thin, smooth and shining, often faintly furrowed longitudinally, yellowish orange, indehiscent. Seed solitary (the rest abortive), completely filling the pericarp, testa thin, rather lax; embryo with very large thick plano-convex cotyledons and a short superior included radicle, no endosperm.

Habitat.—One of the commonest British trees, and forming the greater part of original woodlands in this country, throughout the whole of which it occurs. It is equally abundant and forms large forests in the rest of Europe and in Western Asia, extending into the far north, but stopping short of the Arctic districts; it also grows in North Africa and Syria. As a timber tree also it is very frequently planted, but in this country to a far less extent than was formerly the case.

The flowers appear with the young foliage in April or May, and the male catkins are sufficiently abundant to be conspicuous in spite of their small size; they fall off entire soon after the pollen is shed. The little scaly cup surrounding the stamens is above described as a perianth, but may be with equal propriety considered to be an involucre of bracts.

Botanists are not in accord as to whether *Q. sessiliflora* and *Q. pedunculata* are distinct; A. De Candolle treats them as subspecies. The latter is the more common tree in England and is the form figured. From this *Q. sessiliflora* differs technically in the want of a stalk to the acorns and the greater length of the leaf-petiole; the leaf is also more elongated and the mode of growth of the tree more erect; intermediate forms, however, occur, yet foresters generally consider the two abundantly distinct. The latter is often called the Durmast Oak. There are besides an immense number of varieties and local forms, many of which have been described as species; in De Candolle's 'Prodromus' thirteen varieties are described under the subspecies *pedunculata*, and nineteen under the subspecies *sessiliflora*.

Hook. f., Stud. Fl., p. 344; Syme, E. Bot., viii, p. 145; Watson, Comp. Cyb. Br., p. 310; Gren. & Godr., Fl. France, iii, p. 116; Ledebour, Fl. Rossica, iii, p. 589; A. DC., in DC. Prod., xvi, 2, p. 4; Willk. & Lange, Prod. Fl. Hisp., i, p. 238; Lindl., Fl. Med., p. 291.

Official Part and Name.—QUERCUS CORTEX; the dried bark of the small branches and young stems of Quercus pedunculata, *Willd.* (B. P.). The dried bark of the small branches and young stems (I. P.). It is not official in the Pharmacopœia of the United States; the inner barks of Quercus alba and of Quercus tinctoria being there substituted for it; these are described under those two plants.

Collection and Preparation.—In the British Pharmacopœia the bark is directed to be collected in spring, from trees grown in Britain. The Pharmacopœia of India also directs the bark to be collected in the spring. This direction should be carefully attended to, because at this season the bark contains more

astringent matter, and is more easily separated from the wood than at any other period of the year. In practice, however, in this country, the usual time of barking is from the beginning of May to about the middle of July; and the process is as follows:—The barkers make a longitudinal incision with a mallet furnished with a sharp edge, and a circular incision by means of a barking bill. The bark is then removed by the peeling irons; the separation being promoted, when necessary, by beating the bark with the square end of the mallet. It is then carefully dried in the air by setting it on what are called lofts or ranges, and is afterwards stacked.

General Characters and Composition.—Oak bark is usually found in pieces of from one to two feet long, and it varies very much in appearance according to the age of the stem or branch from which it has been obtained. The bark of the small branches and young stems, which is alone official, occurs in quills which are usually about a tenth of an inch or less in thickness. It is nearly smooth externally, and of a shining silvery or ash-grey colour, variegated with brown. Internally it is cinnamon-coloured or brownish-red, and longitudinally striated. The fracture is fibrous and tough; its taste very astringent; and its odour is very feeble except when moistened, when it resembles tan. The bark of old stems is in thick, more or less flattened pieces, which are very rough externally from the presence of numerous deep cracks and wrinkles. It is very inferior in its medicinal properties to the young bark, and should not be substituted for it.

The most important constituent of oak bark is a peculiar kind of tannic acid, which was first noticed by Stenhouse in 1843, and then proved by him to be different from the tannic acid of nut-galls; it is termed *querci-tannic acid*, and according to Neubaer it exists in young oak bark in the proportion of from 7 to 10 per cent. A solution of gelatine is precipitated by an aqueous solution of oak bark; and the latter solution becomes dark blue or purple on the addition of perchloride of iron. A solution of tartarated antimony causes no precipitate with a watery solution

of oak bark. The bitter, colourless, crystallizable, neutral substance, described by Gerber, in 1843, and named *quercin*, requires further examination; the recent experiments of Eckert failed to detect it in young oak bark. Besides *querci-tannic acid*, oak bark also contains a small quantity of *gallic acid*, *pectin*, and other vegetable and inorganic constituents.

Medical Properties and Uses.—The effects of oak bark are similar to those of other vegetable astringents containing tannic acid. It is, however, but little employed as an internal remedy, although in the form of a decoction it has been found very useful in chronic diarrhœa, in the advanced stages of dysentery, and in alvine hæmorrhages, &c. But the decoction is chiefly used as a local astringent in the form of a lotion, gargle, or injection, for various purposes, as in indolent ulcers, relaxed sore throat, leucorrhœa, &c. Poultices of the powdered bark have also been applied with advantage to gangrenous and ill-conditioned ulcers.

The chief use of oak bark is not for medicinal purposes, but for tanning leather, for which purpose it has always been largely employed. It has also been used for the preparation of inks, and for other purposes.

Besides the bark the wood of this tree is well known as forming most valuable timber; and the fruits (acorns) have been also recommended as food for cattle, but recent experience would seem to show that in some cases at least, they act injuriously.

Per. Mat. Med., by B. & R., p. 492; Pharmacographia, p. 534; Bentl., Man. Bot., p. 634; Steph. & Church., Med. Bot., by Burnett, pl. 151; Watts' Dict. Chem., vol. v, p. 8; Bloxam's Chemistry, 3rd edit., p. 585.

DESCRIPTION OF PLATE.

Drawn from a tree in the Royal Gardens, Kew.

1. A young branch with male and female flowers.
2. Portion of male catkin.
3. An anther.
4. Female flowers.
5. Section of ovary.
6. Ripe fruit.
7. Acorn removed from the cup.
8. Seed, with one cotyledon removed.

(2–5 enlarged.)

D.Blair F.L.S. ad. sicc. del. et lith.

M.& N.Hanhart imp.

QUERCUS INFECTORIA, *Olivier.*

N. Ord. CUPULIFERÆ.

Tribe

Genus Quercus, *Linn.*

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249. Quercus infectoria, *Olivier, Voy. dans l'Emp. Oth.*, ii, p. 64 (1800).

Syn.—Q. lusitanica, var. infectoria, *A. DC.* Q. rigida, *C. Koch.* Q. petiolaris, *Boiss.*

Figures.—Steph. & Ch., t. 152; Woodville, vol. v; Olivier, Voy. dans l'Empire Othoman, Atlas, tt. 14, 15, cop. in Nees, t. 94, and Hayne, xii, t. 45; B. & S., t. 296.

Description.—A shrub or rarely a small tree, erect, with irregular spreading branches, bark brownish-grey, the young twigs usually woolly or downy. Leaves alternate, stalked, the petioles varying from very short to ¾ inch long, blade usually 2—3 inches long, broadly oval- or obovate-oblong, rounded at both ends, rather shallowly cut into large, acute or obtuse rounded teeth or lobes, stiff and thick, smooth above, usually with minute scattered stellate hairs chiefly on the nerves beneath; stipules as in *Q. Robur*. Flowers as in the last, but the male catkins shorter, with the axis more hairy, the perianth in 4—7 divisions. Fruit much as in *Q. Robur*, sessile or stalked, the cup deeper, slightly constricted at the mouth, the scales very much adpressed, ovate-lanceolate, covered with a dense grey tomentum, the glans usually somewhat longer and narrower, reaching as much as 1½ inch in length.

Habitat.—This kind of Oak grows in many parts of Asia Minor abundantly, especially in Syria; the same form occurs in Greece, Southern Turkey, and Cyprus. Though we have for the sake of distinction retained Olivier's specific name, we cannot regard *Q. infectoria* as other than a form of the very variable *Q. lusitanica* under which indeed all recent writers place it, and which in one or other of its varieties (twelve are enumerated by De Candolle) ranges through Spain and Portugal, and extends throughout the Mediterranean region. It is almost as polymorphic as *Q. Robur*,

from which it is chiefly distinguished by its smaller size, less indented leaves and longer acorn, with a rather differently-shaped cup. The leaves vary from small, subspinous, and oval to almost entire and rounded; the amount of hair on the under surface is also very variable. It is in cultivation at Kew with other species.

The flowers appear in May and the fruit is ripe in September, the foliage is persistent till the spring, or sometimes even longer.

There seems no doubt that the bulk of the best Aleppo or Turkey galls are the production of this kind of oak, but other varieties of *Q. lusitanica* as well as allied species also afford them.

Webb, Iter Hispan., p. 11; A. DC., in DC. Prod., xvi, 2, p. 17; Willk. & Lange, Fl. Hisp.; Lindl., Fl. Med., p. 291; Flück. and Hanb., Pharmacogr., p. 536.

Official Part and Name.—Galla; excrescences on Quercus infectoria, *Olivier*, caused by the punctures and deposited ova of Diplolepis Gallæ tinctoriæ, *Latr.* (B. P.). Excrescences caused by the punctures and deposited ova of Diplolepis Gallæ tinctoriæ (I. P.). Galla; a morbid excrescence on Quercus infectoria (U. S. P.).

Production.—Galls are morbid excrescences or tumours, formed of hypertrophied vegetable tissues, the result of their puncture by the horny ovipositors of female Hymenopterous insects and the deposit in them of an egg or eggs. In the present case the insect is the *Cynips Gallæ-tinctoriæ*, Olivier (beautifully figured by C. Curtis in Steph. and Church., t. 152), the female of which deposits her eggs in the young leaf-buds; these latter then undergo great enlargement, and ultimately form the galls. On a section of one of these galls there is found a soft somewhat spongy tissue in which are several scattered vascular bundles; the exact centre being occupied by the ovum which is surrounded by very juicy tissue the cells of which contain starch. It is not until the gall has attained its full development that the egg is hatched and the larva or grub commences to feed on the juices of the central tissue; the cavity of the gall is never more than just

large enough to contain the larva, and soon becomes lined with a wall of hard cells, the tissue of the whole gall gradually becoming harder. As soon as the grub has reached its full development it passes into the pupa or chrysalis stage, and in process of time is transformed into a small four-winged fly about ¼ inch in length; this cuts with its mandibles a passage to the surface and escapes by a circular orifice near the middle of the gall. Hence if we examine those galls from which the insect has thus escaped we observe externally a small round hole leading to a cylindrical canal which passes to the centre of the gall; but on those galls from which the insect has not escaped we find no opening externally.

Varieties and Commerce.—There are several varieties of oak galls, which vary much in size, shape, weight, character of surface, and other particulars; but the ordinary galls of commerce are known as *Aleppo, Turkey,* or *Levant Galls,* and will be alone described. Formerly these galls, or nutgalls as they are also termed, formed a very important commercial product from the province of Aleppo, but of late years, in consequence of the increased use of some other dyeing and tanning substances, the trade in nutgalls has considerably declined. These galls are exported from Trebizond, and from Smyrna, Bassorah, and other Turkish ports.*

General Characters and Composition.—In commerce two kinds of Aleppo galls are distinguished, namely, *blue* or *green galls,* and *white galls,* the former of which are the most esteemed, and are alone official. *Blue* or *green galls,* or, as they are sometimes called, *black galls,* are those which are gathered before the insect has escaped, and are consequently imperforate. They are hard, heavy, globular bodies, varying in diameter from nearly half an inch to about three quarters of an inch or more; they are somewhat tuberculated on their surface, the tubercles and the intervening

* The insect which forms the common hard gall of English oaks is *Cynips Kollari,* Giraud, for description of which, and of other British species, reference may be made to the Rev. T. A. Marshall's papers in the Entomologists' Monthly Mag., iv (1867), pp. 6, and seq.

spaces being usually smooth; they have a dark blueish-green or olive-green colour externally, and are yellowish or brownish white within, and have a small cavity in their centre, in which may be found the remains of the larva or the more or less developed insect, according to the period at which the galls have been gathered. They have no odour, but an intensely astringent and somewhat acidulous taste, which is ultimately followed by some degree of sweetness. *White galls* are those from which the fly has escaped, hence they are perforated from the surface to the central cavity (which is here sometimes as much as a quarter of an inch in diameter) by a small circular canal. They are larger than the blue galls, lighter coloured, being pale yellowish brown, less compact, less heavy, and are not so astringent; they are of inferior value.

The most important constituent of nutgalls is that kind of tannic acid which from having been first distinguished in them is called *gallo-tannic acid*. The best galls yield from 60 to 70 per cent. of this tannic acid, although in some cases not more than about 30 per cent. is obtained. Galls also contain 3 or more per cent. of *gallic acid*, together with *sugar*, *resin*, and other unimportant substances. Infusion of galls reddens litmus paper, forms an inky compound on the addition of a persalt of iron, and a yellowish-white precipitate with a solution of gelatine.

Medical Properties and Uses.—Galls are the most powerful of known vegetable astringents, hence they are applicable in all cases where astringent medicines are required. In their crude state they are, however, but little used, except externally, but the official tannic and gallic acids which are obtained from them, are much more largely employed medicinally. In the form of decoction or when powdered, galls have been recommended as an antidote in poisoning by emetia and the vegetable alkaloids generally; also in that of those vegetable products as opium, colchicum, nux vomica, &c., the activity of which depends on an alkaloid; and in poisoning by tartarated antimony. The powers of galls, however, as an antidote, require further investigation. The official tincture of galls when diluted with water forms a

very useful and convenient astringent gargle and wash; and the official ointment of galls, and the ointment of galls with opium, more especially the latter, are valuable applications to hæmorrhoids after the inflammatory stage has passed. The diluted tincture or ointment of galls may be also employed to give tone to, and lessen discharges from, mucous membranes, as in gleet, leucorrhœa, &c.

The tincture of galls is also used as a test for the alkaloids, gelatine, and the persalts of iron. If kept, however, for some time, it no longer forms precipitates with solutions of gelatine and the vegetable alkaloids, as its tannic acid becomes by keeping converted into gallic acid; it still, however, serves to detect iron salts.

The principal use of galls is for the preparation of the official tannic and gallic acids; for dyeing and tanning purposes; for the preparation of ink; and for other purposes in the arts.

Per. Mat. Med., vol. ii, pt. 1, p. 343; Per. Mat. Med., by B. & R., p. 493; Pharmacographia, p. 536; U. S. Disp., by W. & B., p. 415; Guibourt, Hist. des Drogues, vol. ii (1869), p. 292; Lacaze-Duthiers in Ann. Sci. Nat., ser. 3, vol. xix (1853), p. 273, with 4 plates, and Pharm. Journ., ser. 1, vol. xiii, p. 16; Prillieux in Ann. Sci. Nat., ser. 6, vol. iii (1876), p. 113; Gmelin's Chemistry, vol. xv (1862), p. 449; Watts' Dict. Chem., vol. ii, p. 762; Schorlemmer, Chemistry of the Carbon Compounds, 1874, p. 463; Garr., Mat. Med., p. 355.

DESCRIPTION OF PLATE.

Drawn from specimens collected in Asia Minor by P. Russell, Kotschy, and Balansa, in the British Museum.

1. Young branch with male catkins.
2. Male flower.
3. Anthers.
4. Section of the same.
5. Branch in fruit with a gall.
6. Section of glans.
7. Seed, with one cotyledon removed.
8. Section of a gall.

(2–4 enlarged.)

3
4
5
6
7
2
8

D.Pair ad nat. del. et lith.

M & N Hanhart imp.

CORNELL
UNIVERSITY

N. Ord. ARACEÆ. Le Maout & Dec., p. 831.

Tribe *Acoroideæ*. Lindl., Veg. K., p. 193 (N. Ord.).

Genus Acorus,* *Linn.* Kunth, Enum. Plant., iii, p. 87. Species 2 (or more?), natives of the northern hemisphere.

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279. Acorus Calamus,† *Linn., Sp. Plant, ed.* 1, *p.* 324 (1753).

Sweet Flag. Cinnamon Sedge.

Figures.—Woodville, t. 248; Barton, t. 30; Hayne, vi, t. 31; Steph. and Church, t. 32; Nees, t. 24; Berg & Sch., t. 8 c; Syme, E. Bot., ix, t. 1391; Schnitzlein, Iconographia, t. 72 bb; Nees, Gen. Fl. Germ.

Description.—An herbaceous perennial with a very long, indefinite, branched rhizome immersed in the mud, with short joints and large leaf-scars, cylindrical or somewhat compressed, about ¾ inch in diameter, smooth, pinkish or pale green, the leaf-scars brown, white and spongy within, giving off below numerous, long straight slender roots. Leaves few, distichously alternate, forming erect tufts at the extremities of the rhizome-branches 3 to 4 feet or more long, about an inch wide, broader at the insertion on the rhizome, tapering into a long acute point, entire, smooth, yellowish green, pink at the base, strongly conduplicate and equitantly sheathing below, sword-like above with the central portion thick and gradually narrowing to the entire edges which are usually somewhat wavy or crimped. Flowering stems (scapes) one or two, each arising from the axils of the outer leaves which they much resemble, compressed-triangular, solid, spongy. Flowers very small, sessile, densely packed on all sides of the axis so as to form a solid, cylindrical, tapering blunt spike (spadix) 2—4 inches long, often somewhat curved, really terminating the scape, but apparently lateral and projecting upwards at an angle from it, the direction of the scape itself being con-

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* *Acorus* or *Acorum*, in Greek ἄκορος, the classical name for the plant.

† The *Calamus aromaticus* of the mediæval druggists; and perhaps the κάλαμος ἀρωματικός of Dioscorides (but see also no. 297).

tinued by a tapering two-edged bract (spathe), 2—3 feet long, in all respects like the leaves. Perianth polyphyllous, of 6 leaves imbricated in two rows, erect, oblong-obovate, acute, scarious, thicker at the top and bent inward, one-nerved, whitish, inconspicuous and soon withering. Stamens 6, opposite to and as long as the perianth leaves, either free or very slightly united with their bases, filaments membranous, flattened, slightly tapering upwards, with a dark nerve up the centre, anthers small, readily detached, 2-celled, cells divergent at the base. Ovary large, exceeding the perianth and stamens, obovoid-top-shaped, trigonous but irregularly so from pressure of adjacent flowers, smooth, grooved along the angles, the exposed portion thick, pale green, bluntly pointed, the summit capped by the minute sessile stigmas, the lower portion thin and white, 3-celled, the lower part of the cells excavated in the substance of the spadix, filled with a brittle gelatinous substance in which the ovules are immersed; ovules very minute, 5 or 6 in each cell, forming tufts which are pendulous from the large placentas projecting from the upper part of the axis, and are surrounded at the base by a tuft of very fine hairs; coats of the ovule very distinct though extremely delicate and transparent, their mouths prolonged into tubes with a fringe at the orifice, the inner one protruded much beyond the outer, nucleus small, dark, club-shaped. Fruit (not seen) bluntly six-sided, prismatical-clavate, about $\frac{3}{4}$ inch in diameter in the thickest portion, herbaceous, indehiscent, 1—3 seeded. Seed with a thin testa, embryo in the axis of the horny endosperm, green, cylindrical, radicle next the hilum.

Habitat.—Though at the present day common throughout the continent of Europe, there is little doubt that the Sweet Flag is indigenous to more eastern countries. So far as Central and Western Europe is concerned it appears to have been almost certainly spread by means of botanic gardens since the end of the sixteenth century. Clusius first cultivated it at Vienna in 1574 from a root received from Asia Minor, and distributed it to other botanists in Belgium, Germany, and France. As is the case with other rhizomatous aquatics it is very readily propagated, and it

rapidly became established. In England it was probably introduced about 1596, being first grown by Gerard, who may have received it from Robin of Paris, who had it in cultivation a few years before; it is now found thoroughly wild on the margins of ponds and rivers in most of the English counties, and is in some districts very abundant; in Scotland it is scarce and evidently introduced. It is found in all European countries except Spain, and becomes more abundant eastward, and in Southern Russia, Northern Asia Minor, and Southern Siberia appears to be a native, extending also to India, China, and Japan; it is also found in the Northern United States of America, where according to A. Gray it is also truly indigenous. It is said to be grown to a small extent in Burma and Ceylon, and is common in gardens in India, but the wild plant is that generally collected for use especially in South Russia.

Though naturally an aquatic, the Sweet Flag will grow well in gardens, but under such conditions rarely flowers. Ripe fruit must be very rarely produced; we have never met with it in this country, or seen it in herbariums; it is somewhat differently described by writers. The leaves are much like those of *Iris*, but may be distinguished from that and from all others by the peculiar crimped edges of the leaves and their aromatic odour when bruised, or broken across. The delicate ovules form a beautiful and instructive subject for microscopic examination.

Several species have been described from India and China, which are probably mere varieties of *A. Calamus*. The small *A. gramineus*, Ait., of North China and Japan, is, however, generally allowed to be distinct.

Syme, E. Bot., ix, p. 11; Hook. f., Stud. Flora, p. 394; Watson, Comp. Cyb. Br., p. 348; Trimen, in Journ. Bot., 1871, p. 163; Ledebour, Fl. Rossica, iv, p. 13; Gren. & Godr., Fl. France, iii, p. 332; A. Gray, Man. Bot. U. States, p. 478; Benth., Fl. Hongkong., p. 345; Lindl., Fl. Med., p. 606; Schott, Prod. Syst. Anoid., p. 578.

Official Part and Name.—CALAMUS; the rhizome (U. S. P. *Secondary*). It is not official in the British Pharmacopœia, or

the Pharmacopœia of India. But it was formerly recognised in both the London and Edinburgh Pharmacopœias.

Collection.—The rhizomes of sweet flag should be collected late in the autumn, or in the spring; and after being carefully washed, and freed from their roots, dried with a moderate heat. In the process of drying they shrink to about half their original diameter, but their odour and taste are much improved. In Germany the rhizomes are sometimes peeled before they are dried, but such an operation materially injures their properties, as we have explained below in speaking of their general characters and composition. Formerly the London market was supplied from Norfolk and the banks of the Thames; but at the present time the rhizome is generally obtained from Germany, although in rare cases also from India. Flückiger and Hanbury believe that it is brought into Germany from Southern Russia.

General Characters and Composition.—Calamus or sweet flag rhizome as found in commerce, is in flattened, somewhat curved pieces, which are usually some inches in length, and from about half an inch to an inch in diameter. Externally it has a yellowish-brown or fawn colour, and is more or less shrunken and wrinkled; it is marked on its upper surface with the scars and fibrous vestiges of the leaves, and on its under surface with numerous little elevated pale-coloured circular dots with a dark centre; these latter indicating the points from whence the roots arose. The rhizome breaks with a short rough fracture, its texture is spongy or corky, and its colour internally is pale brown and somewhat roseate. Its odour is aromatic and agreeable; and its taste bitterish, aromatic, and pungent. The Indian variety is said to have a stronger and more agreeable flavour than that obtained in Europe or the United States of America. The rhizome deteriorates by keeping. The decorticated rhizome, which is sometimes imported from Germany, is in greyish-white spongy pieces of variable length. Its odour is similar to the rhizome as ordinarily prepared, but is not so powerful, as the receptacles containing the volatile oil of sweet flag to which the odour is due are more abundant in the external portions of the rhizome.

The decorticated rhizomes are therefore inferior to the ordinary ones of commerce.

The principal constituent of calamus or sweet flag rhizome is *volatile oil*, which can be obtained by distilling it in a fresh or dried state with water. The dried rhizomes yield about 1·25 per cent. of oil; this oil has a yellow colour at first, but becomes red by keeping, it is dextrogyrate, and to its presence calamus owes its odour and aromatic pungent taste. The rhizome also contains a bitter principle, termed *acorin*, which was first isolated by Faust in 1867, and determined by him to be a glucoside; it has since been described by Flückiger and Hanbury as a very bitter, perfectly crystalline body. To the presence of these two principles sweet flag rhizome owes its properties; the other constituents, such as *starch*, &c., are of no importance.

Adulteration.—The rhizome of the common Yellow Flag, *Iris Pseudacorus*, L., is sometimes mixed with that of the Sweet Flag rhizome when the latter is collected in this country; it is readily distinguished by its darker colour, different structure, and want of aromatic odour and taste.

Medical Properties and Uses.—Sweet flag rhizome was formerly much esteemed as an aromatic stimulant and mild tonic; but at the present day it is very rarely employed by regular medical practitioners, either in this country or in the United States, though, as stated by Pereira, it might frequently be substituted with good effect for the more costly oriental aromatics. The testimony of many physicians indicate that it is now too rarely prescribed. It has been from the earliest times one of the most popular remedies of the native practitioners of India; in which country it is to be met with in all the bazaars. Dr. A. T. Thompson and Dr. Royle speak highly of its value in intermittent fevers; either by itself, or in conjunction with other tonics. In Norfolk the powdered rhizome is still employed by the country people for the cure of ague. It has also proved very serviceable in flatulence, flatulent colic, and in atonic dyspepsia; and Pereira found it of especial value in the dyspepsia of gouty subjects. It is also a useful adjunct to tonic or purgative medicines in cases of

torpor of the stomach or alimentary canal. A good form of administration is that of the infusion made by macerating an ounce of the rhizome in sixteen ounces of boiling water, and given in doses of two or more fluid ounces; or it may be chewed habitually as a remedy in the forms of dyspepsia mentioned above. The candied rhizomes are employed by the Turks as a preventive against contagion. In India it is also used as an insectifuge and insecticide, especially in relation to fleas.

Besides its use in medicine it is also employed by snuff manufacturers, more especially in the form of the volatile oil. The latter is also sometimes used in the preparation of aromatic vinegar. When the rhizome is masticated it is said to clear the voice, and it is sold by herbalists for this purpose, and for flavouring beer. Johnston also states that it is used by the rectifiers to improve the flavour of gin; and that it is largely employed to give a peculiar taste and fragrance to certain varieties of beer. In the United States it is also used by the country people as an ingredient in making wine bitters.

Thomson's Lond. Disp., by Garrod, p. 104; Per. Mat. Med., vol. ii, pt. 1, p. 139; Pharmacographia, p. 614; Steph. and Church., Med. Bot., by Burnett., vol. i, pl. 32; U. S. Disp., by W. & B., p. 190; Ainslie's Mat. Med. (Madras, 1813), p. 54; Pharmacopœia of India, p. 249; Stille's Therapeutics and Mat. Med., 2nd edit., vol. i, p. 489; Johnston's Chem. of Common Life, vol. ii, p. 251.

DESCRIPTION OF PLATE.

Drawn from a plant collected at Barnes Common, Surrey.

1. A portion of the rhizome, with the base of the terminal tuft of leaves.
2. Upper part of scape bearing the spadix and spathe.
3. Portion of a transverse section of the spadix, showing vertical sections of four flowers.
4. A flower.
5. Perianth-leaf and stamen.
6. A stamen.
7. Diagram of the flower.
8. A tuft of ovules.

(3–6 enlarged; 8 greatly magnified.)

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